FREIGHT CAR EQUIPMENT

A REFERENCE BOOK FOR CAR MEN ON FREIGHT CAR WORK, DESCRIBING AND ILLUSTRATING IN DETAIL THE DIFFERENT KINDS OF FREIGHT CARS NOW BUILT AND VARIOUS DEVICES USED IN THEIR CONSTRUCTION, AND REPAIRS. IT ALSO CONTAINS INSTRUCTIONS ON THE WESTINGHOUSE AND NEW YORK FREIGHT AIR BRAKE. TABLES SHOWING AVERAGE WEIGHTS OF MATERIAL, AVERAGE HOURS OF LABOR, AND AVERAGE COST OF MAKING REPAIRS, ETC.

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679 FERDINAND AVE.,
DETROIT, MICH.

INTRODUCTION

AFTER the issue of book entitled "Freight Repairs," several years ago, a number of requests were received from car men throughout the country, asking for a more complete book on the same line, covering freight car work. Instead of these requests diminishing they have of late become so numerous that the publisher has at last yielded to this strong influence in attempting to give car men in this issue a larger book on freight car repairs and construction.

In offering this book to the railroad public, it is the purpose and aim of the publisher to furnish the Car Department with a ready means of reference on freight car work, and especially on repairs to foreign cars. Great care has been taken in compiling this data and the weights, labor charges, and other tables, are believed to be as nearly correct as is possible to obtain. In the illustrations only such devices are shown that are at present being used in freight car construction and repairs.

Each subject is condensed as much as possible, and only a treatise given on such work as will be of value and assistance to Car Foremen, Inspectors and Repairers, in making repairs; inspecting; ordering material and in various ways facilitating the work of the Car Department.

F. J. KRUEGER.

Detroit, Mich., June 1st, 1910.

almost anything that is grown or manufactured, whether perishable or not.

The freight cars used in carrying on the regular freight business of the railways are as follows: Box cars, Refrigerator cars, Stock cars, Poultry cars, Coal cars, Dump cars, Tank cars and Flat cars. There are a great many other cars in service designed for some particular lading which would probably come under the heading of one of the above cars.

A number of illustrations are shown in this book which give the general construction and details of various freight cars now in use, sufficiently clear without any extensive explanation.

In Plate 1 is shown a perspective drawing of an American standard freight box car body, in which nearly every part of a freight box car body is illustrated. A standard Truck for this car is shown in Plate 70.

In Plates 2, 2A and 2B is shown the side and plan elevation of a 38-foot box car with steel underframe of 80,000 lbs. capacity.

A half longitudinal section of a 36-foot stock car, as well as half plan of underframe for same is shown in Plates 3 and 3A.

The adoption of steel in coal cars is shown in Plates 4 and 5. Plate 4 illustrates a pressed steel drop bot-38-foot gondola car of 100,000 lbs. capacity, and Plate 5 plan and side elevation of a 100,000 lbs. capacity pressed steel hopper car.

A Bettendorf steel tank car is illustrated in Plate 6. This car has a capacity of 12,000 gallons.

In Plates 7 and 7A is also shown a Bettendorf steel underframe flat car.

The American Freight Car

CHAPTER I.

The term car in America is used to designate a vehicle or carriage used by railways to carry on their business of transportation.

Cars which help to comprise the equipment of a Railroad are divided into two general classes, namely. Passenger and Freight cars. The latter are divided into freight cars proper and work or construction cars.

Freight cars is the general term used to designate all kinds of cars which carry commodities, etc., for the general public, and are used in the interchange of freight business. It is on the construction of these cars that the writer will give a treatise.

The evolution of the American freight car has been gradual, starting with only the old style wagons as a model from which to draw ideas. The car builders having in charge this branch of railway construction have improved from time to time, always keeping abreast with the times, with the view in mind of meeting the demands of the public, until we now have the modern freight car, capable of carrying

almost anything that is grown or manufactured, whether perishable or not.

The freight cars used in carrying on the regular freight business of the railways are as follows: Box cars, Refrigerator cars, Stock cars, Poultry cars, Coal cars, Dump cars, Tank cars and Flat cars. There are a great many other cars in service designed for some particular lading which would probably come under the heading of one of the above cars.

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In Plates 7 and 7A is also shown a Bettendorf steel underframe flat car.

SIDE ELEVATION OF A 38-FT. BOX CAR WITH STEEL UNDERFRAME

80,000 Lbs. Capacity.

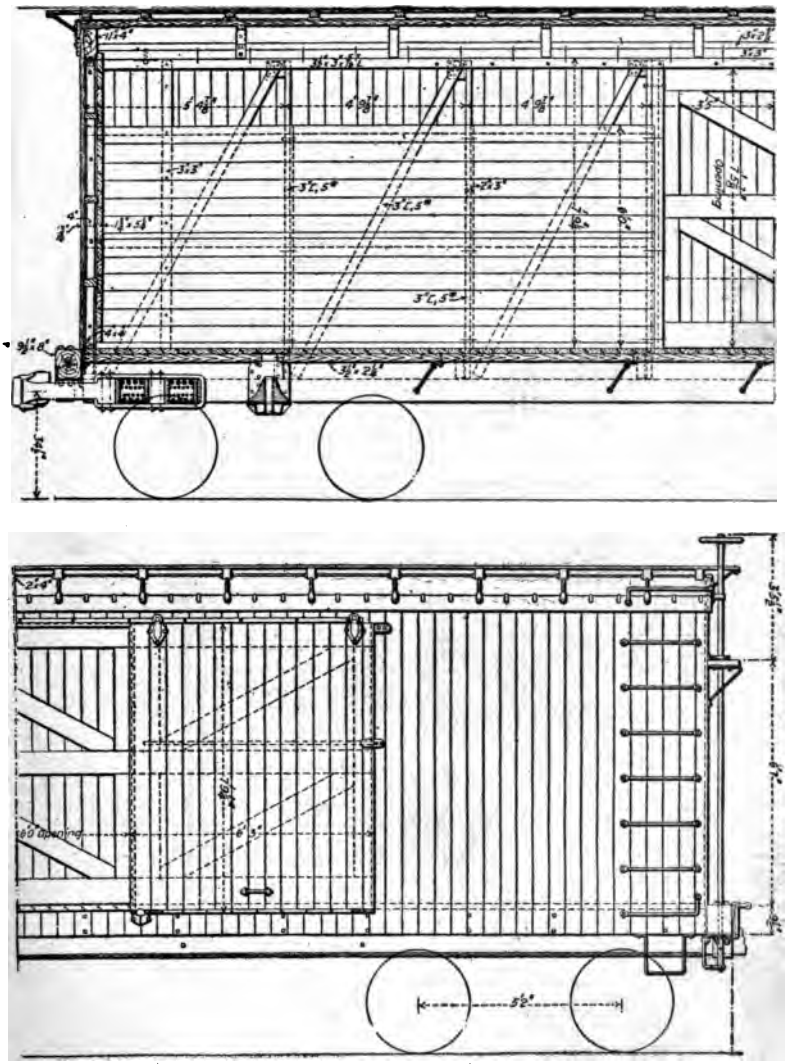


PLATE No. 2.

PLAN ELEVATION OF 36-FT. BOX CAR WITH STEEL UNDERFRAME

80,000 Lbs. Capacity.

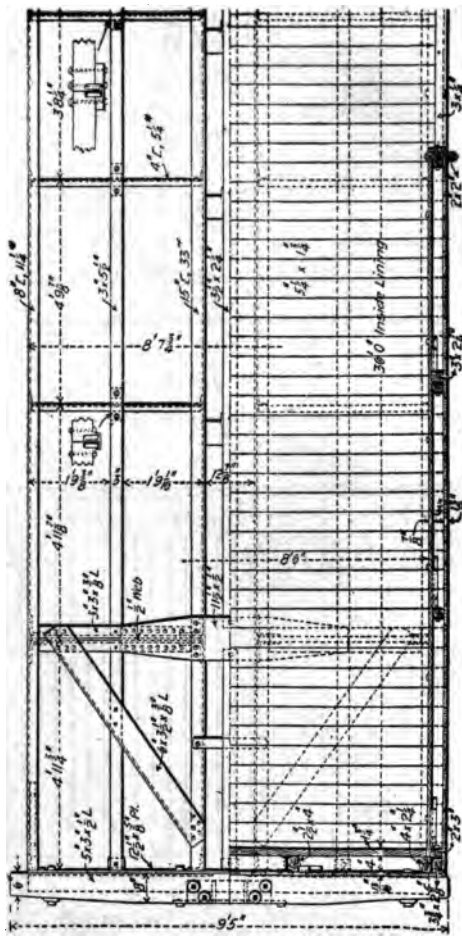


PLATE No. 2 A.

PLAN ELEVATION OF 36-FT. BOX CAR WITH STEEL UNDERFRAME

80,000 Lbs. Capacity.

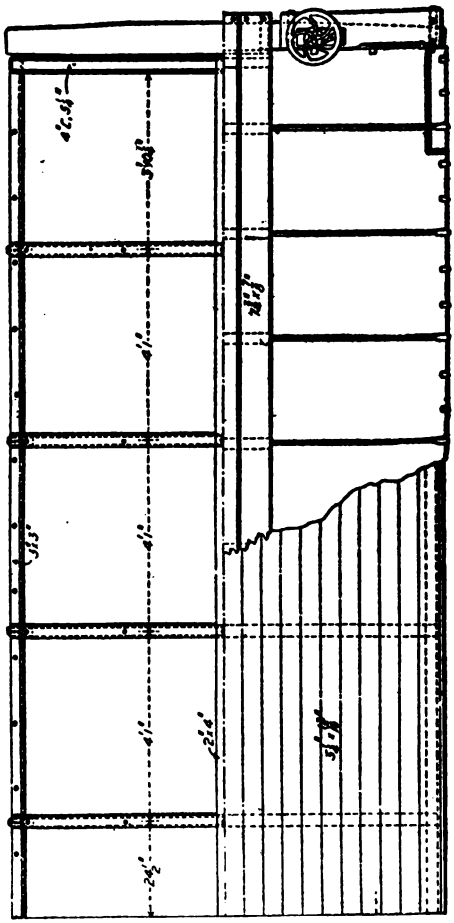
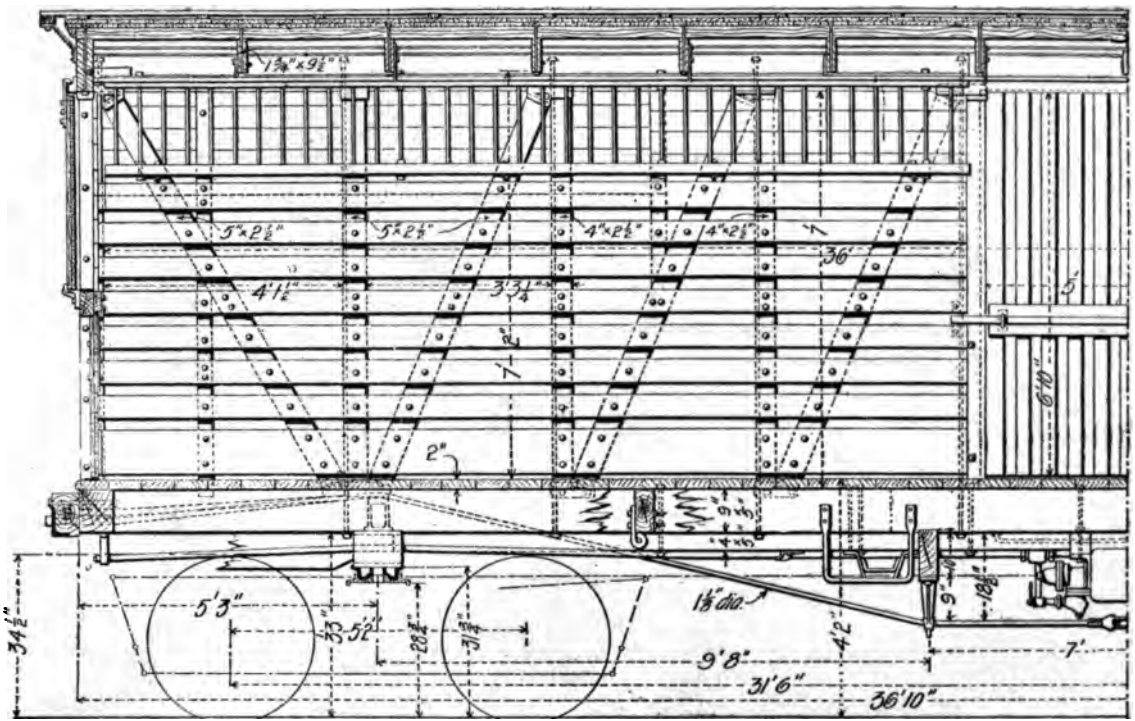


PLATE No. 2 B.

HALF LONGITUDINAL SECTION OF 36-FT. STOCK CAR



HALF PLAN OF UNDERFRAME OF 36-FT. STOCK CAR

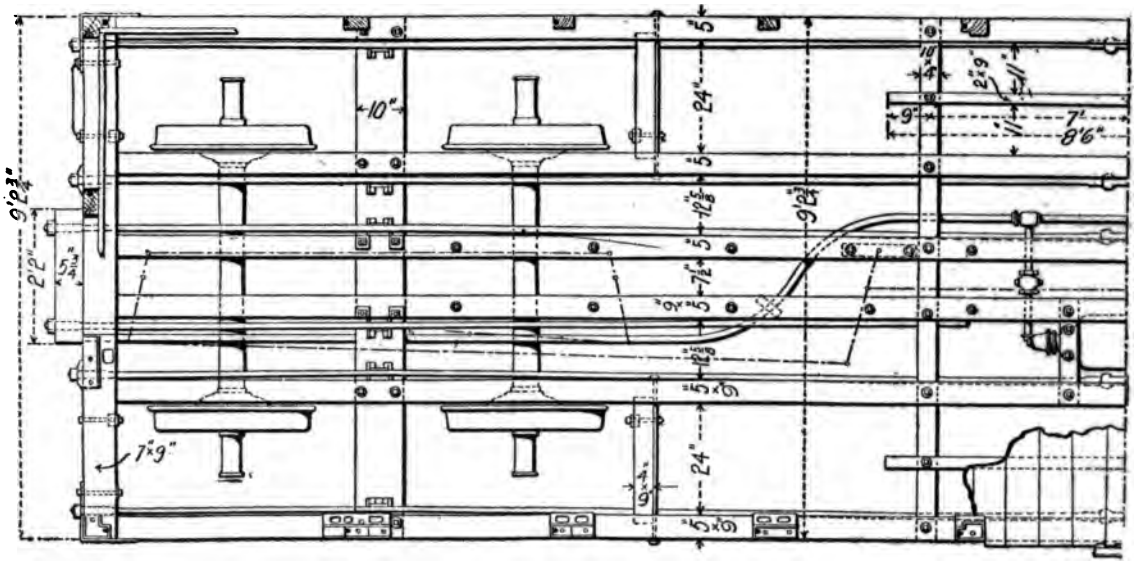
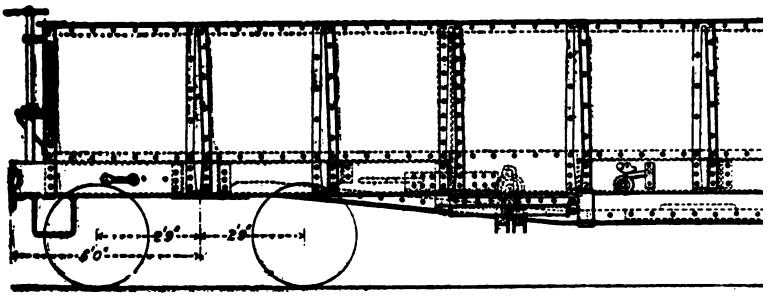
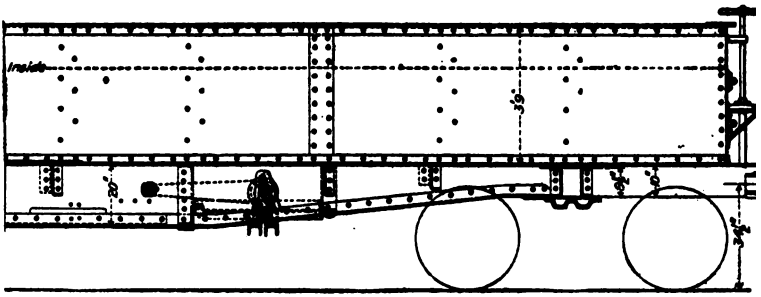
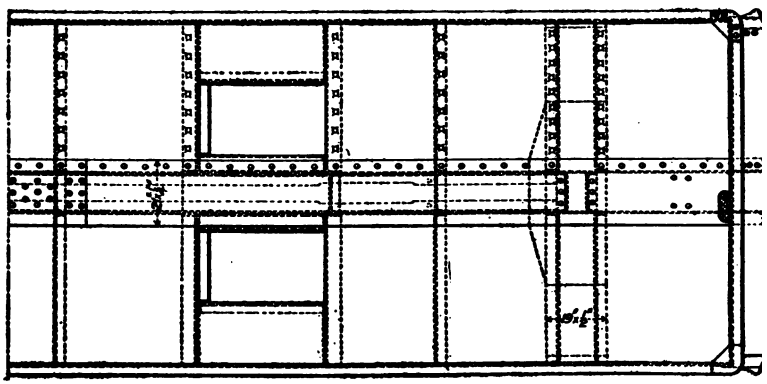
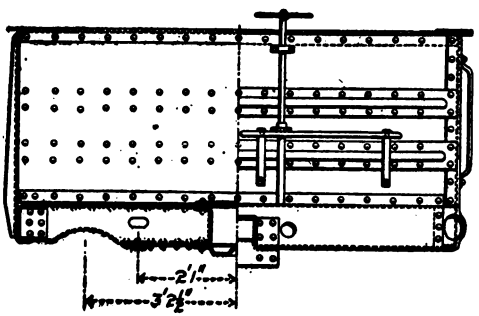


PLATE No. 3 A.









PRESSED STEEL
DROP BOTTOM 38-F
GONDOLA CAR

100,000 Lbs. Capacity.

PLATE 4.

PLAN AND SIDE ELEVATION OF HOPPER CAR PRESSED STEEL

100,000 Lbs. Capacity.

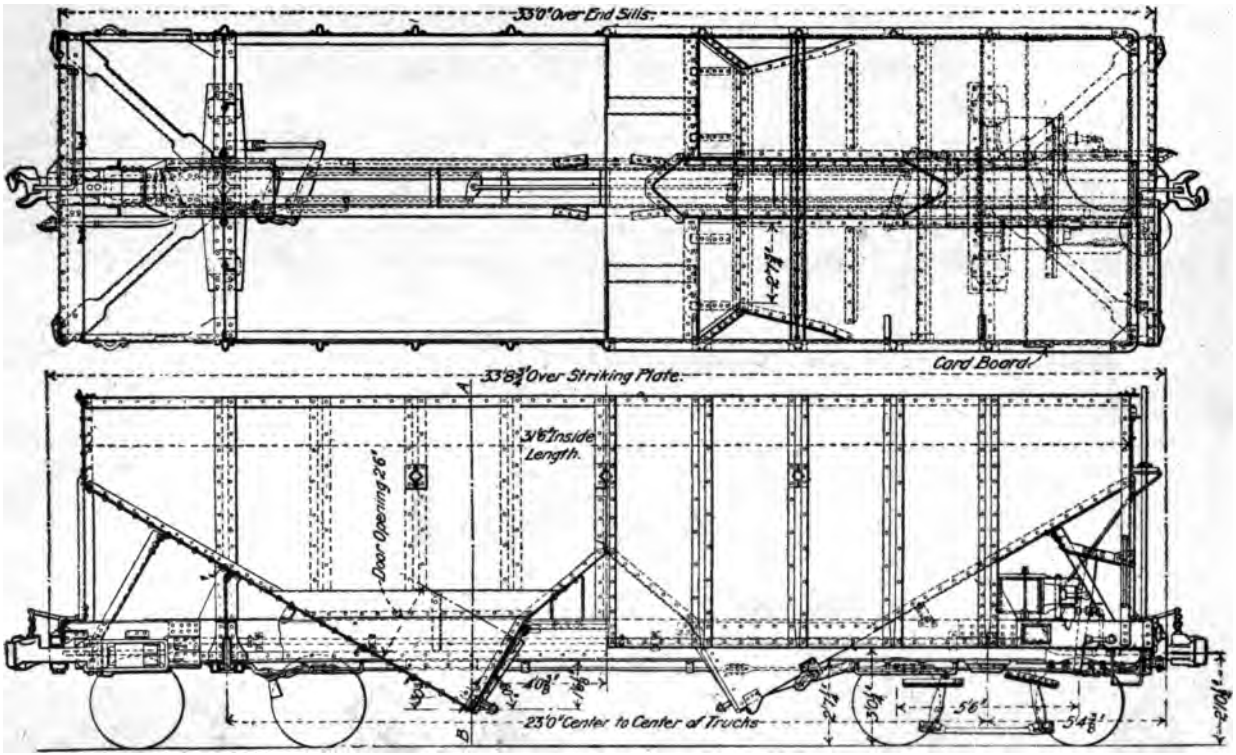


PLATE No. 5

BETTENDORF STEEL UNDERFRAME TANK CAR

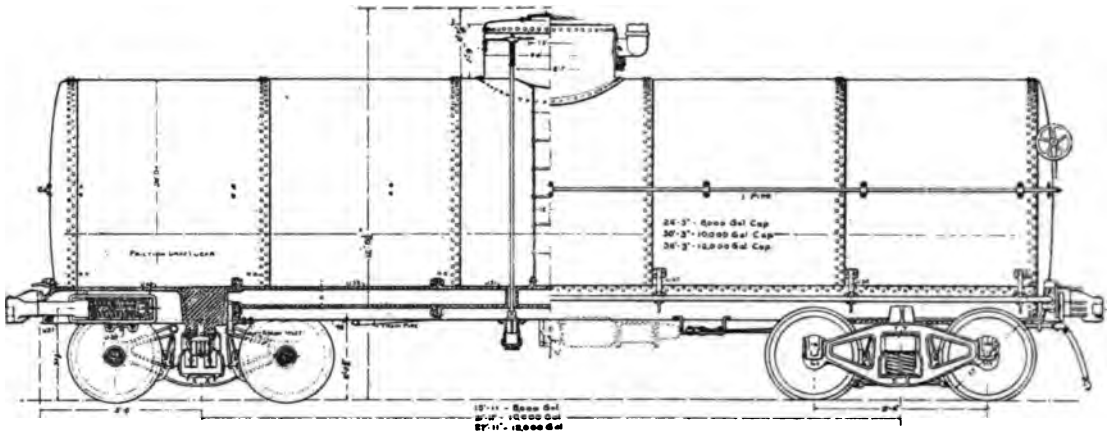


PLATE No. 6.

BETTENDORF FLAT CAR WITH STEEL UNDERFRAME

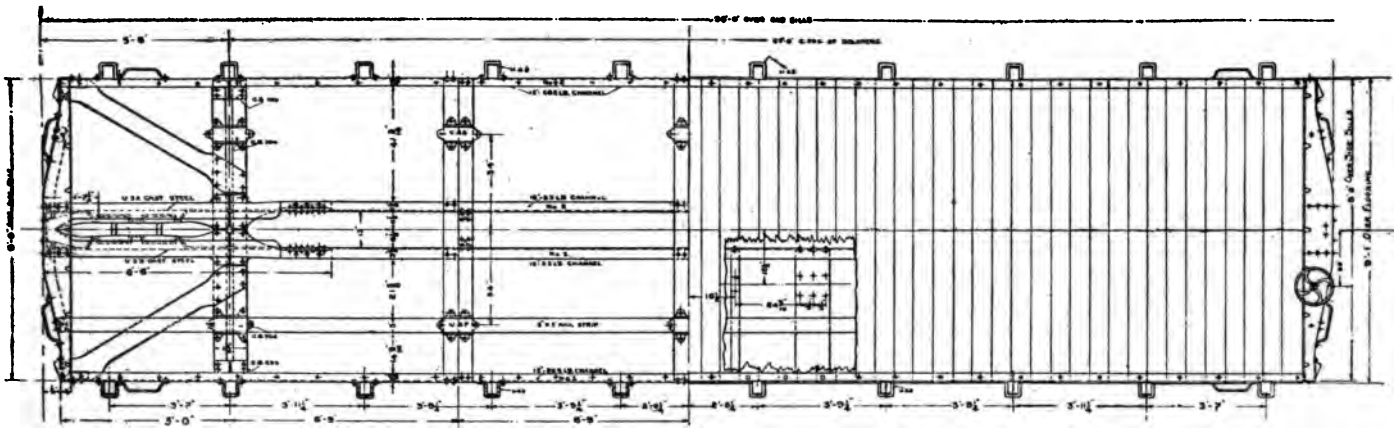


PLATE No. 7.

BETTENDORF FLAT CAR WITH STEEL UNDERFRAME

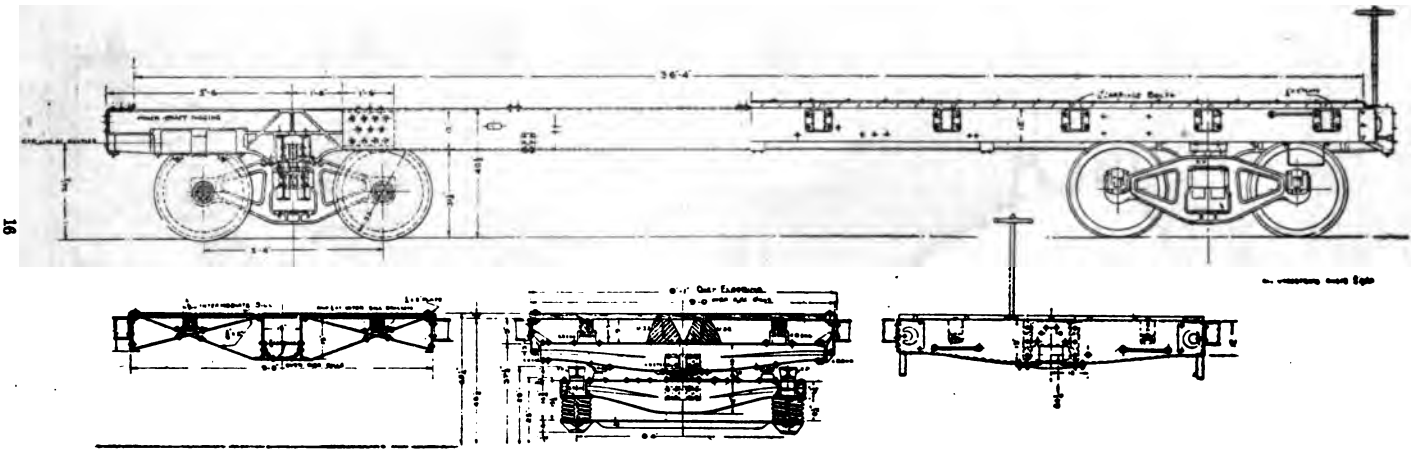


PLATE No. 7 A.

The construction of freight cars is different in many respects from stationary structures, for in the latter the weight to be carried is the principal factor to be considered when calculating on the size of material required, while in the designing and construction of cars the size and strength of material must further be figured to allow for the severe strains the various parts of the car are subjected to, which they receive while in service, and which is probably equal to, if not greater than the load carried.

A freight car should also be so constructed that the parts most frequently needing renewal or repairs can be removed and replaced in the shortest possible time, and with the least expense. The Master Car Builders' Association has, with this point in view, as well as from their past experience in railways, being required to carry such an enormous supply of material to enable them to repair foreign cars equipped with various devices not standard and foreign to their own equipment, have for years been laboring, and with good results, to standardize all items that frequently need renewal and repairs, especially such parts as couplers, springs, brasses, etc.

The development of the American freight car from a 10-ton to a 50-ton capacity car has been gradual, so has also been the introduction of steel into the car body. While a number of all steel heavy capacity cars have now been in use some 11 or 12 years, the Master Car Builders are still building a great number of box and other car bodies of wood with only the body bolsters made of steel, where steel would no doubt be just as suitable for the underframe, if not better than the wood.

Owing to the heavy capacity cars now being used,

and also on account of the severe switching shocks caused by the heavier trains and equipment in road service, many of the western lines and practically all the coal and ore carrying roads have purchased a large number of steel hopper and gondola cars, and with the addition of the numerous steel underframe box and other cars having been built for the various railroads throughout the country in the past few years, have therefore, it seems arrived at a point where it is generally accepted that a substitute for wood had to be found.

CHAPTER II.

UNDERFRAMING.

Sills, Body Bolsters, Cross Tie Timbers, Truss Rods and Flooring.

The first part that is placed together in the upper construction of a car is the underframe, which consists of the main longitudinal sills, see Plate 1, Fig. 52, 53, 54 and 55, end sills; see Plate 1, Fig. 58, body bolsters; see Plate 1, Fig. 64, and center cross tie timbers; see Plate 1, Fig. 57.

Main longitudinal sills, of which there are usually six, two side sills, two center sills, and two intermediate sills, and in heavy capacity cars eight are used; this is done by adding two more intermediate sills. These main sills are held in position and made to form the principle part of the upper construction by the body bolster and center cross tie timbers being securely bolted to each sill, and the end sills are fitted to each end of the main sills by tenons, see Plate 8, or by sill pockets bolted to the end sill, which have recently been adopted by several lines, and are considered superior to the tenons, as they will not only facilitate the work in removing and

replacing the sills, but are also less subject to hold moisture in the mortise, which usually causes premature decay of same (see Plate Nos. 9-10), the whole structure being held in place by the truss rods, (see

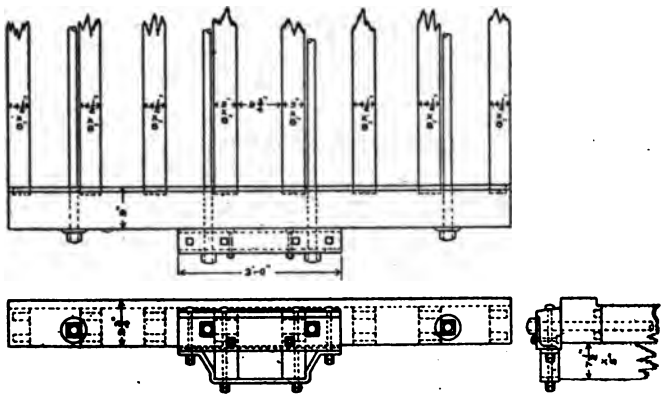


PLATE No. 8.

Plate 1, Fig. 59, also Plate 8. The longitudinal sills are usually of long leaf Southern yellow pine, and carefully inspected timbers only are used for same. Sills vary in sizes, the dimensions depend upon the kind of cars constructed, the strength desired and the particular service for which same are intended.

The Master Car Builders' Association have adopted as a standard, the following finished sizes for sections of longitudinal sills. In doing so they expressed the belief that these recommendations afford a sufficient range of sizes to cover all requirements of design; they are good merchantable sizes, and if used as suggested car repairs will be greatly expedited, as there will be less delay in getting spe-

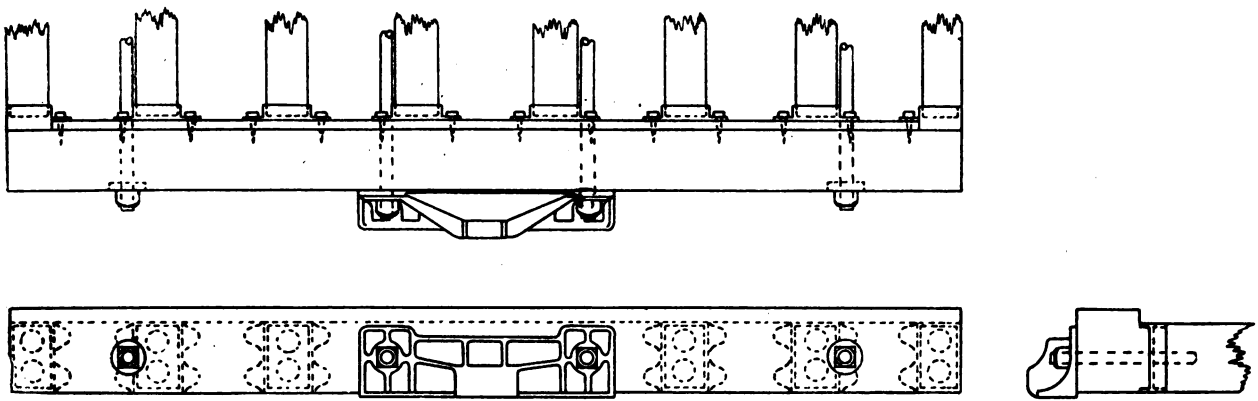
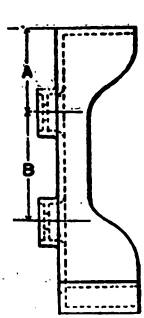
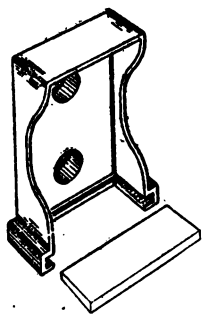


PLATE No. 9.

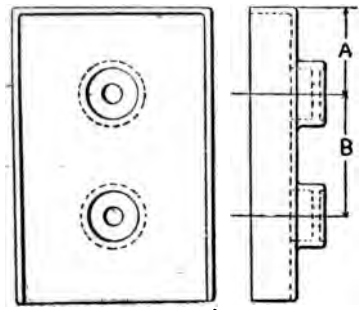
SILL POCKETS.



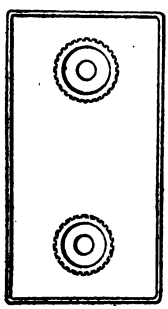
Sill Pockets

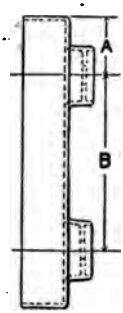


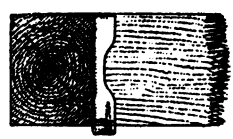
Key Bottoms

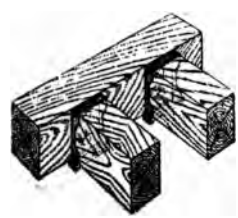


Sill Pockets—OPEN Bottom









Sill Pockets—Closed

PLATE No. 10.

Western Railway Equipment Co., St. Louis, Mo.

cial sizes of lumber, and requisitions for regular sizes can be filled more promptly, as lumbermen can saw in advance of orders with a reasonable certainty of selling their stock.

For cars such as Box, Stock, Flat, Long Gondola, Refrigerator, etc., 32 feet and over in length, but under 40 feet the following sizes:

4" x 8" 4" x 9" 4" x 10" 4½" x 12" 5" x 14"
4½" x 8" 4½" x 9" 4½" x 10" 5" x 12"
5" x 8" 5" x 9" 5" x 10"

For cars 40 feet long and over, such as Furniture and special long gondolas:

4½" x 8" 4½" x 9" 5" x 10" 6" x 12" 6" x 14"
5 " x 8" 5 " x 9" 6" x 10"
6" x 9"

BODY BOLSTERS OR BODY TRANSOMS, as they are sometimes called, are located directly over the trucks at each end of car, and are the main support of same, being so constructed as to receive the weight of the car body and its contents and equalize it to the center of the bolster, where the top center plate is located. Bolsters vary in design and material, the old style being of wood, trussed with rods running through the longitudinal sills, while all mod-

ern Bolsters are either of the wrought iron type, or are made of pressed or cast steel. (See Plate 1, Fig. 64.) Also see the following plates for some of the various kinds now on the market.

CAST STEEL BODY BOLSTER, BOX SECTION

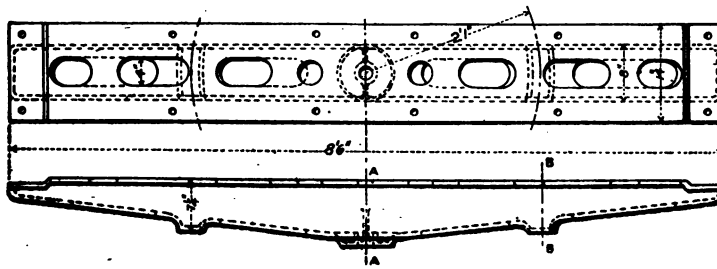


PLATE No. 11.
American Steel Foundries.

CAST STEEL BOLSTER, CHANNEL SECTION

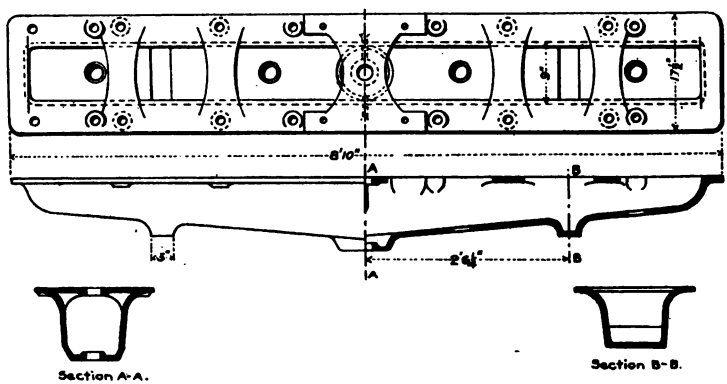
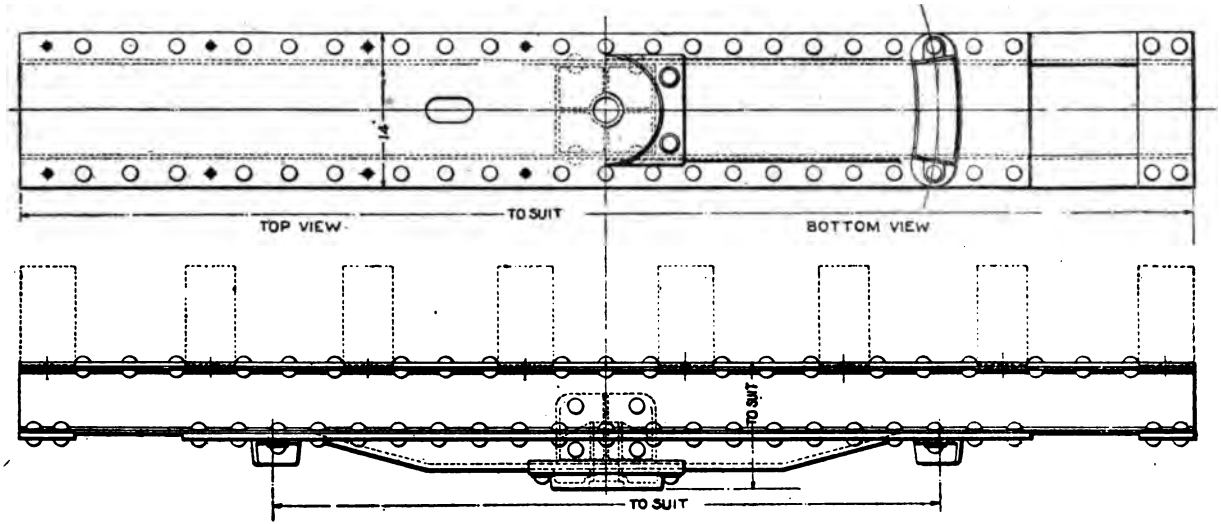
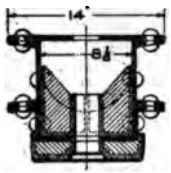


PLATE No. 12.
American Steel Foundries.





STANDARD
"MONITOR" BODY BOLSTER

PLATE No. 13.
Chicago Railway Equipment Co.
Chicago, Ill.

CAST STEEL BODY BOLSTER
For 80,000 lbs. Capacity Box Car.

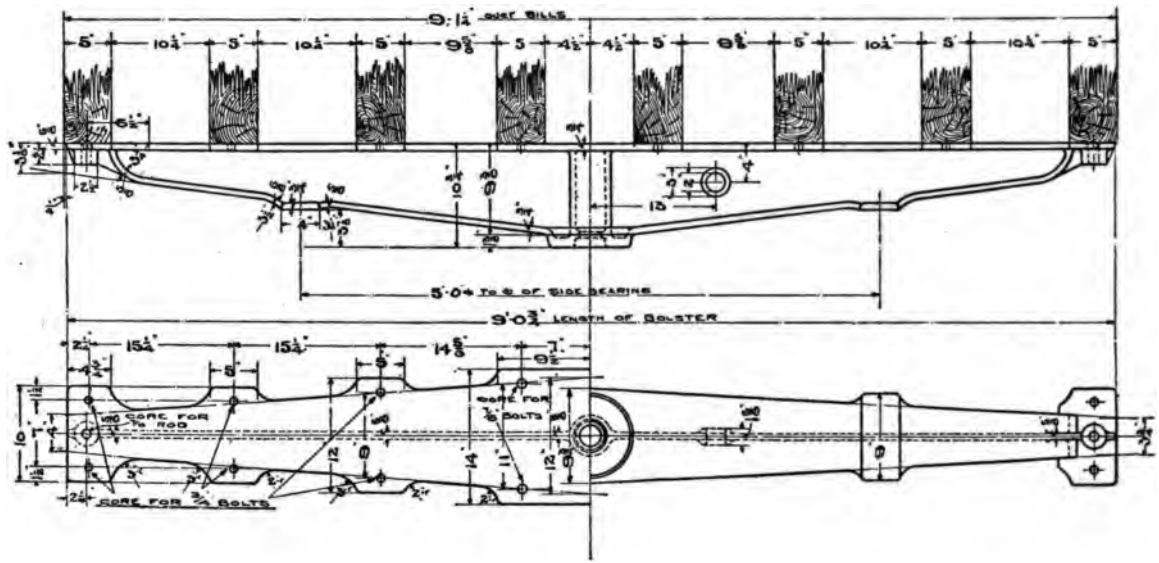


PLATE No. 14.
American Steel Foundries.

CAST STEEL BODY BOLSTER, I-BEAM SECTION

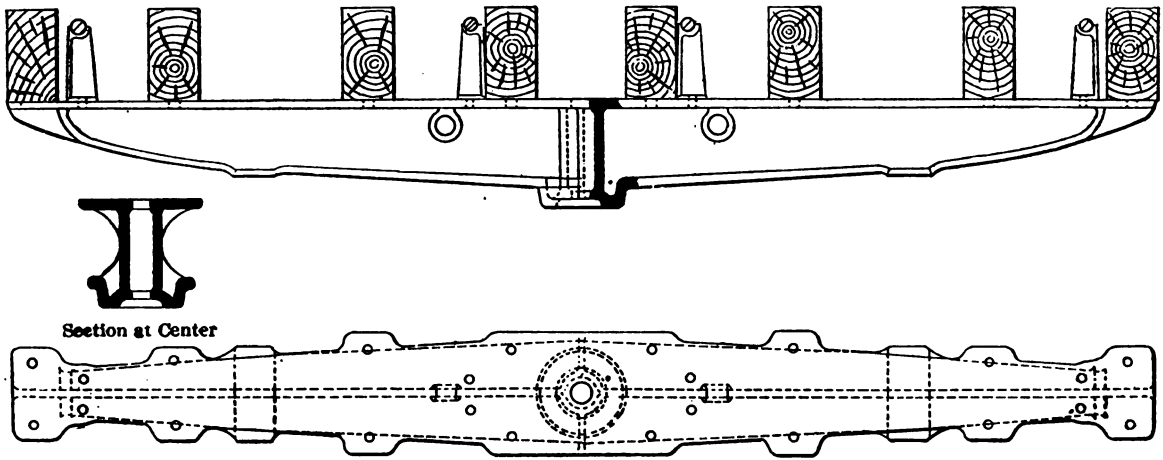


PLATE No. 15

American Steel Foundries.

GOULD CAST STEEL BODY BOLSTER

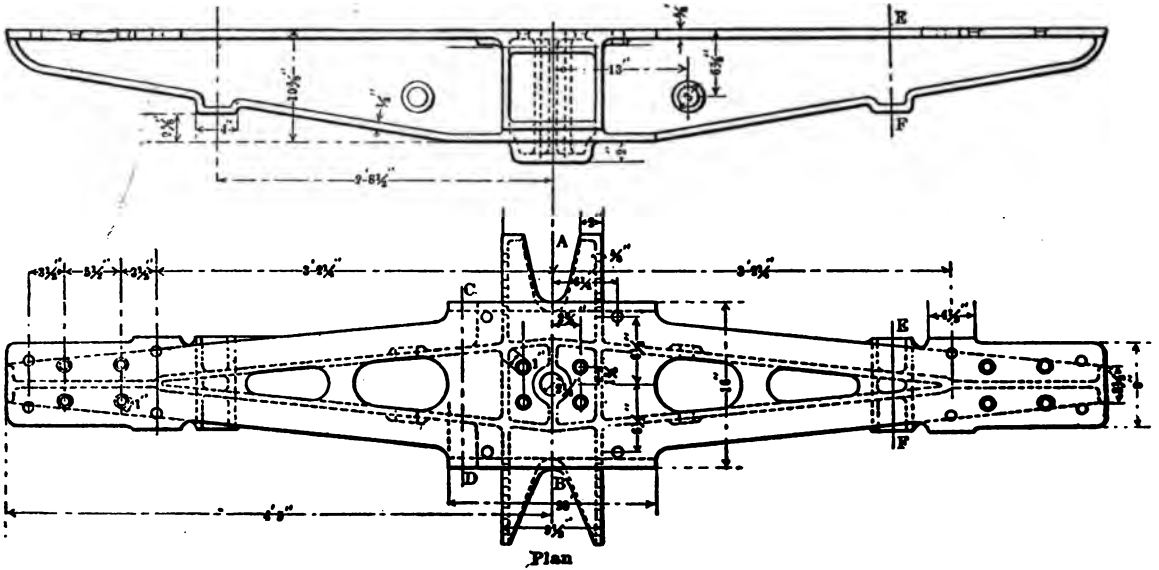


PLATE No. 16

CAST STEEL BODY BOLSTER
FOR 60,000 LBS. CAPACITY BOX CAR.

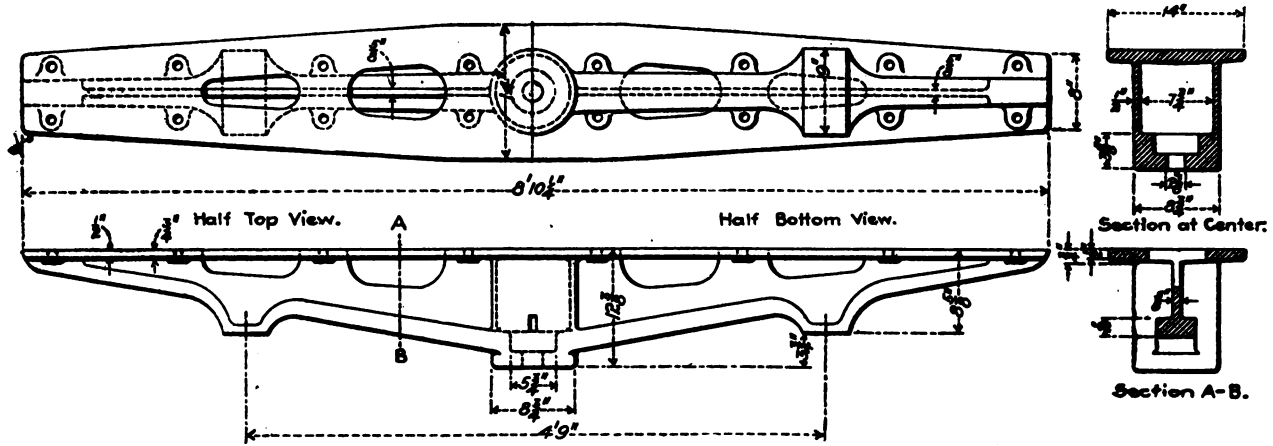


PLATE No. 17.

Commonwealth Steel Co.

SIMPLEX BODY AND TRUCK BOLSTERS WITH SUSEMIHL ROLLER SIDE BEARINGS

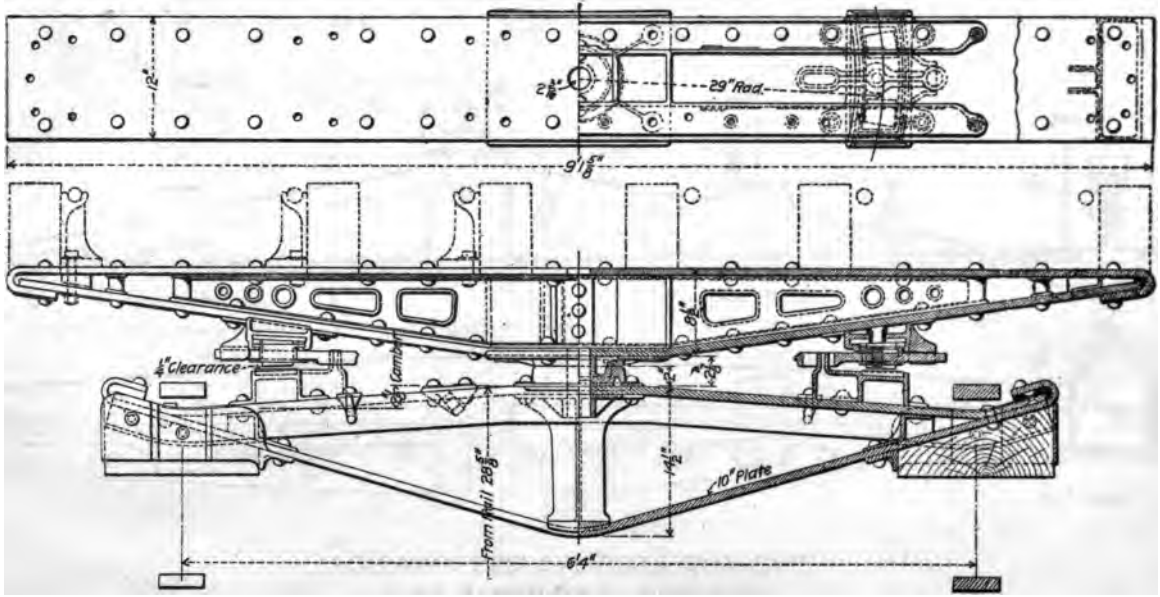


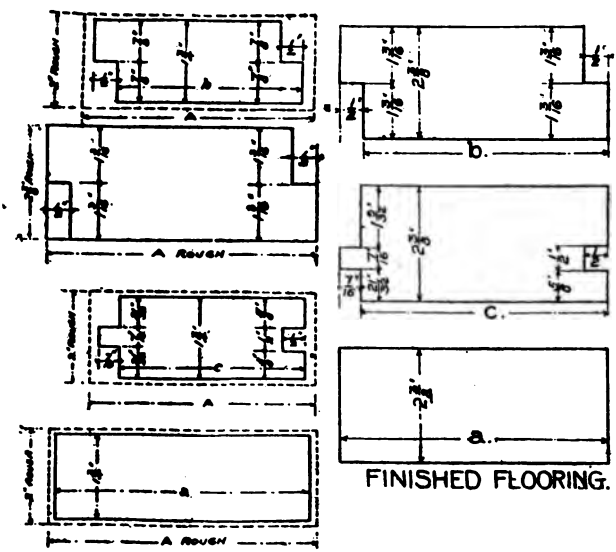
PLATE No. 18.

CROSSTIE TIMBERS OR NEEDLE BEAMS—The object of these timbers are to aid the longitudinal sills and truss rods in supporting the load, and keeping the car from sagging in the center. They are made of wood or pressed steel, (See Plate 1, Fig. 57), and placed an equal distance from the center of the car toward each end, usually 6 to 9 ft. apart, running across and under the sills.

BODY TRUSS RODS at one time were not essential in the construction of a freight car, for the sills and framing could be made sufficiently strong enough to carry the load, but today with our 60,000, 80,000 and 100,000 lbs. capacity cars, they are absolutely necessary. Truss rods run parallel with the sills and vary in number from 2 to 8 (usually 4), they extend through the end sill over the body bolsters and under the crosstie timbers. (See Plate 1, Fig. 59).

FLOORING—After the underframing is erected the flooring is laid. This is usually of hard pine or hemlock, while occasionally however the flooring on some heavy capacity cars is laid of oak. The floor planks are dressed all over to a varied uniform thickness of not less than 1¾ inches, either square edged, ship lapped, or tongued and grooved, placed crosswise of the frame, and securely spiked to the sills. In Plate 20 are the three standard kinds adopted by the M. C. B. Association.

PLATE No. 20.



	5'	6'	7'	8'	9'	10'
A						
a						
b						
c						

FLOORING.

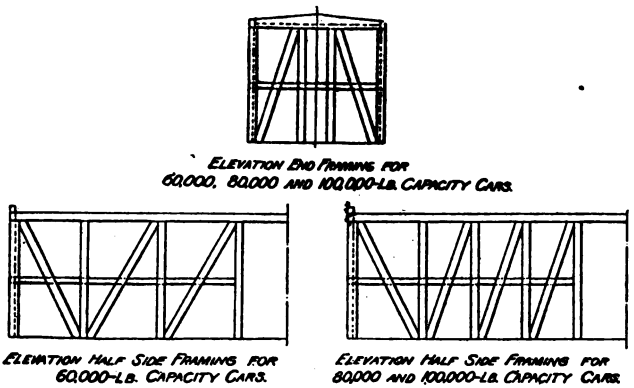
CHAPTER III.

SUPERSTRUCTION OF THE FREIGHT CAR—FRAMING—ROOFING—SHEATHING—DOORS AND THEIR ATTACHMENTS.

FRAMING—The frame work of nearly all classes of freight cars are the same, with the exception of the open top or Gondola Cars It becomes the duty of the designer however to construct the frame work above the sills sufficiently strong and rigid to stand the wear and rough handling which they are subject to. The most common enclosed car is the Box Car, the frame work of which consists of Posts, Plates, Braces, Girths, Carlines and Purlines. See Plate 1. In Plate 21 is shown a standard practice for the framing of box cars as recommended by the M. C. B. Association.

POSTS are designated as side posts, (See Plate 1, Fig. 128), end posts (See Plate 1, Fig. 135), corner posts (See Plate 1, Fig. 133), and door posts

PLATE No. 21.



FRAMING OF BOX CARS.

(See Plate 1, Fig. 126). They are made of oak or hard pine. The corner and door posts should be made of oak. They vary in size from 2″ x 4″ to 6″ x 6″ according to the capacity and design of car built.

PLATES—Plates are divided into side and end plates (See Plate 1, Fig. 139 and 140). Side plates are usually made of the same material as the side sills, and extend from one end of the car to the other. The size of timber used in side plates ranges from 2½″ x 5″ and upward; plates must be of ample size and stiffness, so as not to yield too much laterally under pressure of the load, which is too often the case, and no doubt the principal cause of doors dropping off. The end plates are made of white oak, but hard pine is sometimes substituted, they are 2½″ to

3″ in thickness and form the end support for the purlines and ridge pole (See Plate 1, Fig. 140). The width at the ends of these plates is the same as the side plates, while the center is governed by the pitch of the roof, usually 12″ to 14″ wide.

BRACES OR COMPRESSION BRACES—The object of these braces is to add rigidness to the body of the car. They are called side and end braces. For exact location (See Plate 1, Figs. 130, 131 and 136). Braces are usually of the same thickness and of the same material as the posts. The ends of the braces are fitted in cast Post and Brace Pockets (See Plate 1, Figs. 230 and 231) and never extend beyond the outside face of the sills and plates.

GIRTHS OR BELT RAILS extend around the car on the inside, and are fitted to the posts and braces so as to embrace them. They are usually placed about three feet from the floor, or at a desired height for the inside lining (See Plate 1, Fig. 137 and 138).

CARLINES OR CARLINGS, are bars of wood or iron which extend across the top of the car from one side to the other and support the roof. In recent construction several styles of metal carlines are being used and appear to be giving good satisfaction, (See Plates 22 and 23), but wood is still extensively used, usually oak, varying in thickness from 1⅝″ to 1⅞″ and about 9″ wide in center, placed about three feet apart, the under edge being straight while the upper is cut to the pitch of the roof. (See Plate 1, Fig. 155).

PRESSED STEEL CARLINES.

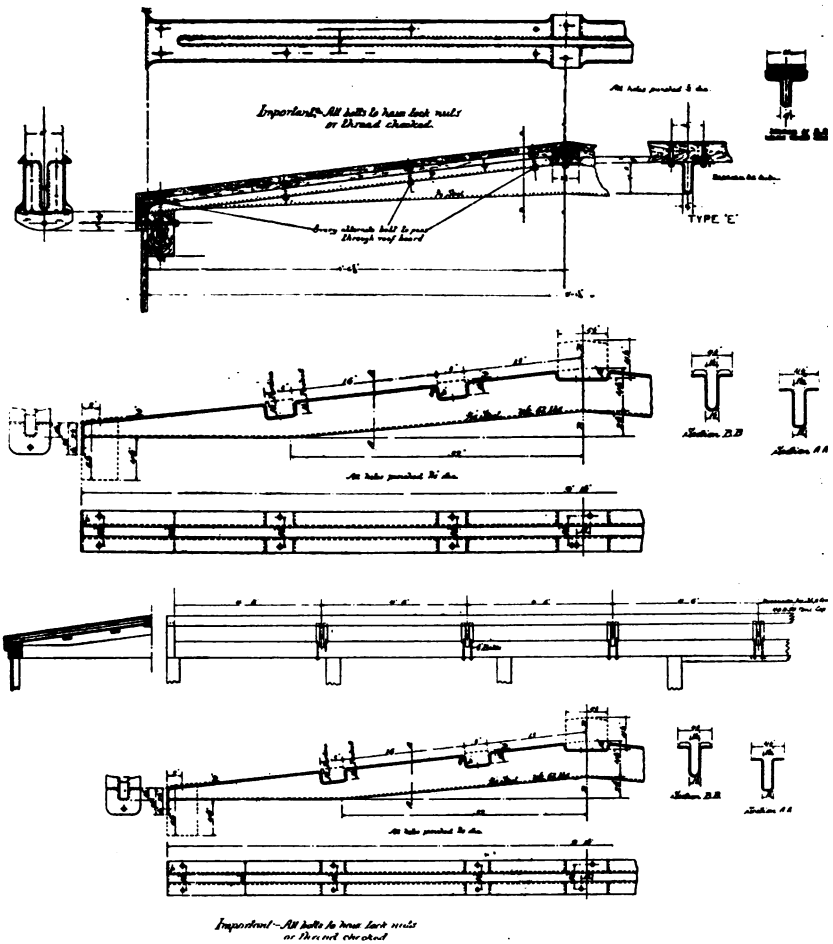


PLATE No. 22.

Cleveland Car Specialty Co., Cleveland, Ohio.

STEEL CHANNEL ROOF CARLINE

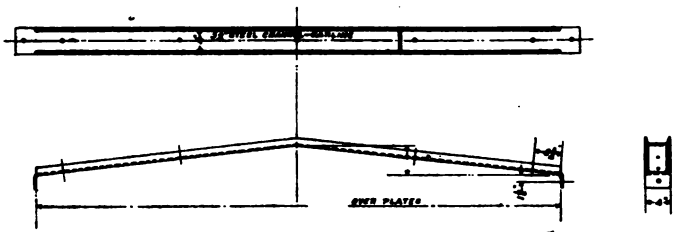


PLATE No. 23.

Standard Railway Equipment Co.

PURLINES are usually made of wood and extend from one end of car to the other, they are not continuous like the side plates and sills, but are jointed over the carlines; they serve as nailing strips for the roof boards. Their size is usually 1¾" x 2½". (See Plate 1, Fig. 159).

RIDGE POLE is located at the peak or ridge of the roof, and is supported by the carlines, which are usually framed to receive the same. It is about twice as wide as the carlines and framed to suit the pitch of the roof. (See Plate 1, Fig. 158).

ROOFS.

Their Construction in General.

ROOFING—A satisfactory or a perfect car roof is one of the great problems which has interested the

railroads throughout the country for a great many years. That is to say, a roof that is an absolute protection against the inclemency of the weather, or one that will, when placed in service, withstand the swaying and twisting of the framework and still be waterproof, and will not readily blow off in severe wind storms, and also one that can be walked upon without injury; one that is not too heavy and can be constructed at a reasonable cost. The various forms in use in freight car construction may be divided generally into the four following classes:

First, what is known as a double board roof, with or without felt or other material between boards. To this class belong many roofs in which the boards are tongued and grooved and have a sheet of painted canvas, asphalt roofing material or other prepared materials between them.

Second, single board roofs, covered with tin or other sheet metal.

Third, roofs made of metal sheets, fastened to purlines and roof strips, and protected by a single layer of roughly matched boards.

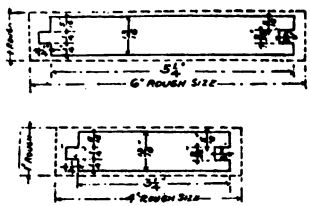
Fourth, a type of double roof consisting of an inside roof covered with felt, tar paper or asphalted canvas, and an outside roof built over it to protect the roofing material from injury.

The double board roof is perhaps the most common car roof in use; it seems to meet the requirements for which it was intended fairly well. One of the redeeming features of this style roof is that it can be easily repaired.

The Master Car Builders' Association have recommended a standard size roof board, it being 13/16" x 5¼" or 13/16" x 3¼". (See Plate 24).

These figures are closely followed. The material used for roof boards is usually well seasoned white

PLATE No. 24.



ROOFING AND LINING.

pine, tongued and grooved and dressed on both sides. Some car builders place an extra U shaped groove at each edge of the board so as to keep as much water from the joints as possible. (For general construction, see Plate No. 1, Fig. 165).

METAL ROOF (OUTSIDE)—The usual method of constructing this roof is shown in Plates Nos. 25 to 28. The boards or sheathing are usually made of a cheap grade of white pine, dressed and matched, placed cross or lengthwise of car, securely fastened to the ridge pole or purline, upon which the roof is placed. These roofs are made of galvanized iron, in some cases sheet iron or steel is used.

METAL ROOF (INSIDE) OR SINGLE BOARD Roof, with metal lining underneath. This roof is used quite extensively and as there are so many various kinds on the market, it is almost impossible to give them all in detail. The lumber used in the construction of this roof is not as high grade as that used in the double board roof, for if any water leaks through, it is conducted to the eaves by the lining underneath, which consists of galvanized iron. (See Plate 30.

HUTCHINS' OUTSIDE METAL ROOF

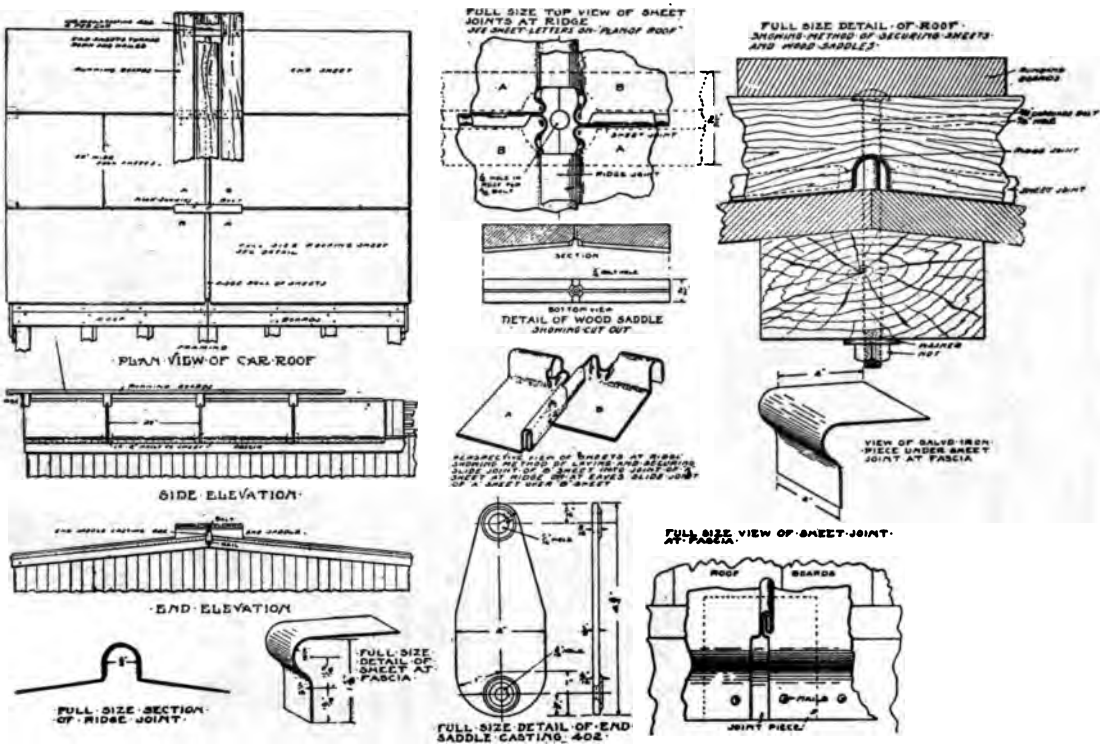


PLATE No. 25.
Hutchins Car Roofing Co., Detroit.

CHICAGO-CLEVELAND OUTSIDE IRON CAR ROOF

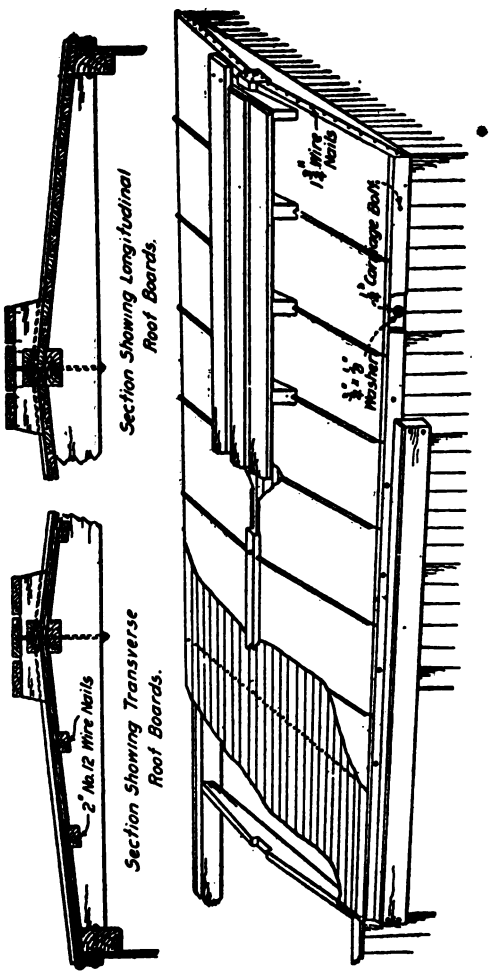


PLATE No. 26.

EXCELSIOR OUTSIDE METAL ROOF

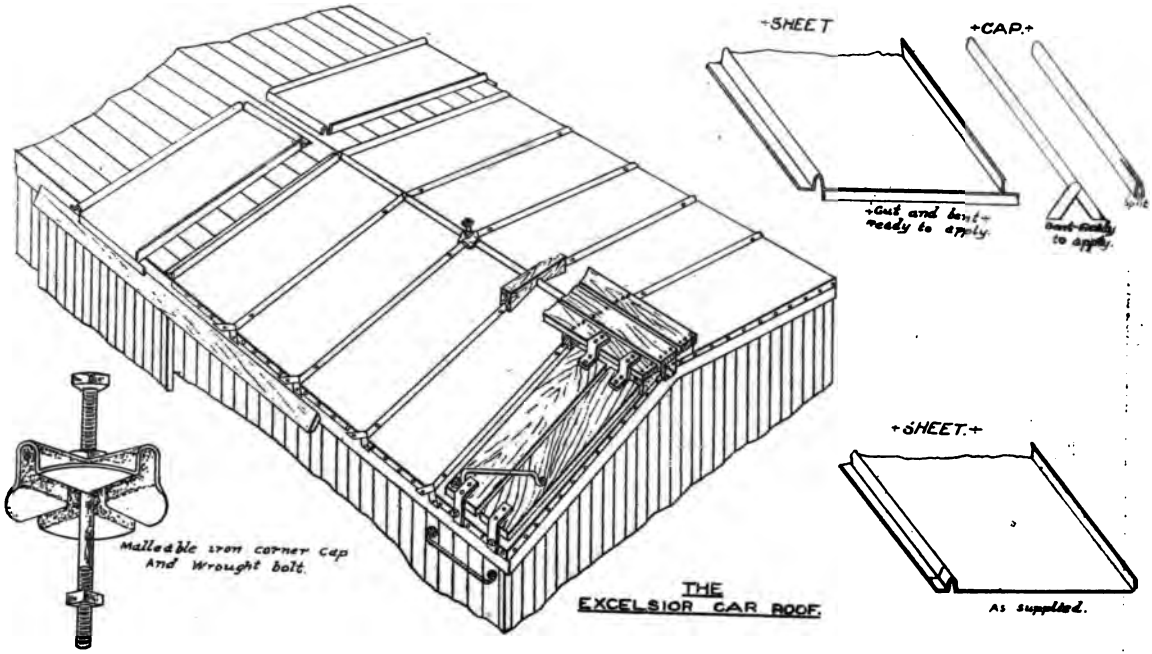


PLATE No. 28.
Excelsior Car Roofing Co.
St. Louis, Mo.

HUTCHINS' METAL INSIDE CAR ROOF

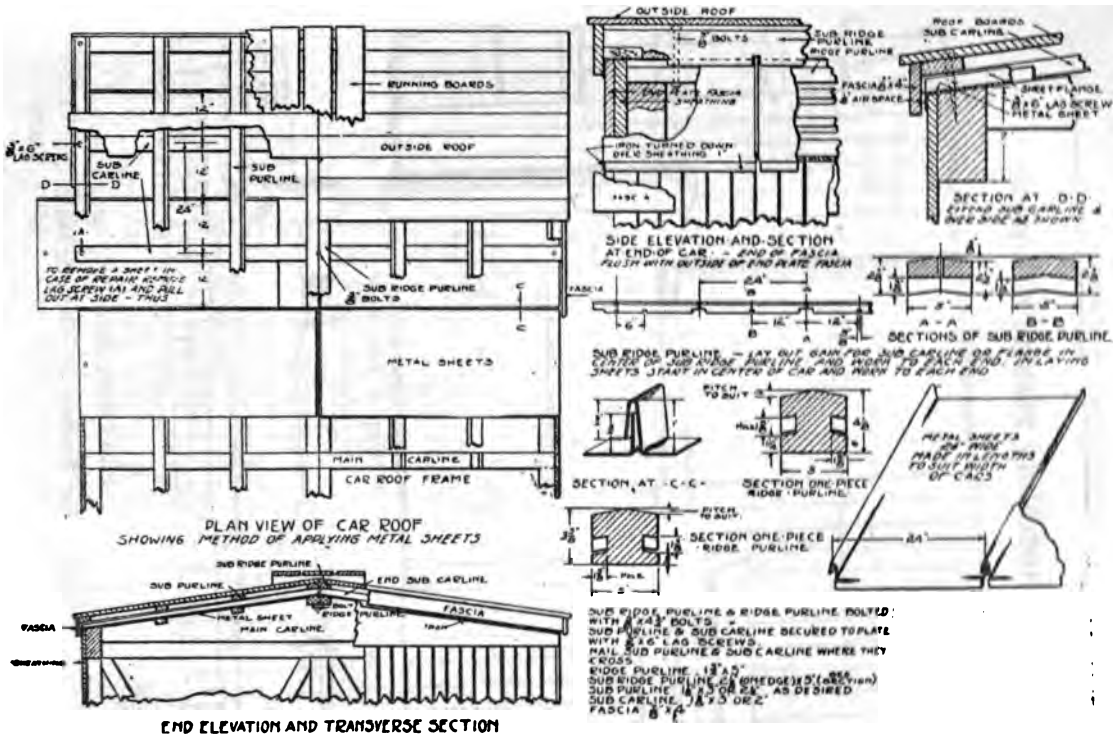


PLATE No. 30.

Hutchins Car Roofing Co., Detroit, Mich.

HUTCHINS' PLASTIC CAR ROOF

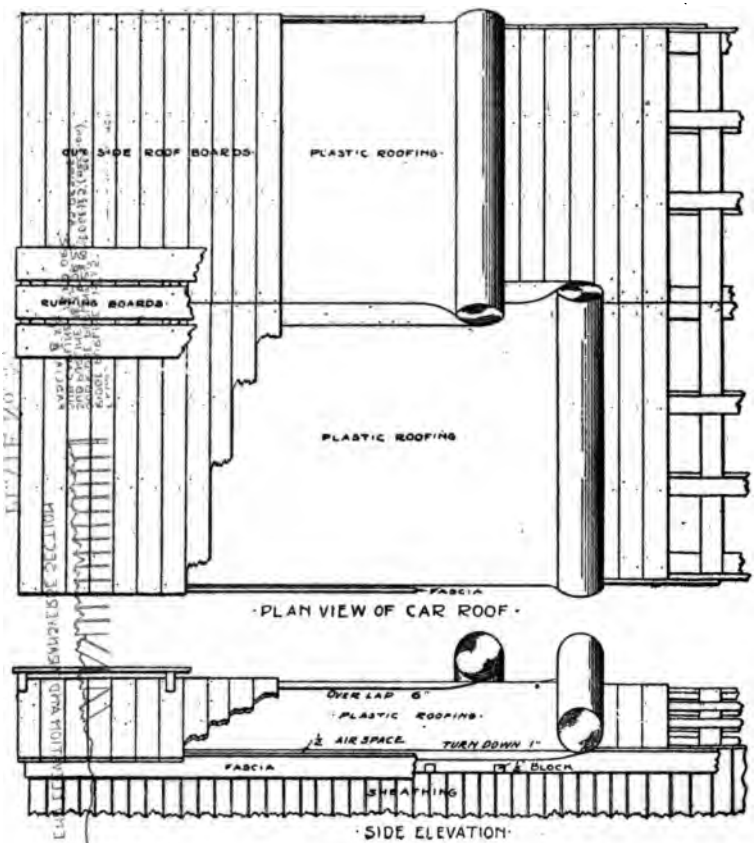


PLATE No. 32.

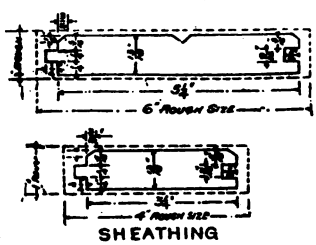
Hutchins Car Roofing Co., Detroit, Mich.

SHEATHING AND LINING.

SHEATHING—Is the board or covering which is nailed to the outside frame-work of the car and forms the enclosure. The material used for sheathing is usually white pine, dressed or surfaced on both sides, tongued and grooved, but often yellow pine answers the purpose, but is not so desirable as the white pine, on account of the sap making it more liable to check and split, will also not hold the paint as well.

The Master Car Builders' Association recommend a standard size sheathing which is 13/16" x 3¼" or 13/16" x 5¼". (See Plate 35). These figures are closely adhered to. (Also see Plate 1, Fig. 161.)

PLATE No. 35.



SHEATHING

LINING—The lining of a box car runs lengthwise on the side and crosswise at the end. It extends about three feet above the floor on sides, and to end plates at ends. The side and end girths are usually used for the top nailing strips, at the bottom it is customary to have a space of about 1¼" or 1½", which is filled in by placing a triangular strip called the grain strip. The quality of lumber used for in-

side lining is usually second or common, graded white pine or any suitable dressed lumber. (See Plate 1, Figs. 141 and 142) Also see Plate 24 for M. C. B. recommended standard.

DOORS AND THEIR ATTACHMENTS.

DOORS like many other parts of the freight car, are still in what might be termed an imperfect state, nevertheless they have received just as much attention as any other part of the car. Both builders and inventors have given the car door a great deal of their time. The most common door in use today is the batten. (See Plate 1, Fig. 186). The construction of this door is very simple, which undoubtedly accounts for its general use. The material used is usually the same as the side sheathing. The Master Car Builders' Association recommend a standard Box Car Side and End door which are fully illustrated in Plates 36 and 37.

This door is more expensive than the other, and its construction a little more complicated. The frame, as illustrated in this cut, is usually of ash, and is put together with a mortise and tenon. The panel is fitted to rabbets cut in the edges of the stiles and rails. The panel work is either nailed or secured to the frame work by screws, which makes a very strong door.

PATENTED DOORS are quite numerous, and it would be impossible to give them all in detail here, but we have fully illustrated those which are most commonly used. See the following Plates, 38 to 42.

M. C. B. RECOMMENDED PRACTICE FOR BOX CAR SIDE DOOR AND FIXTURES

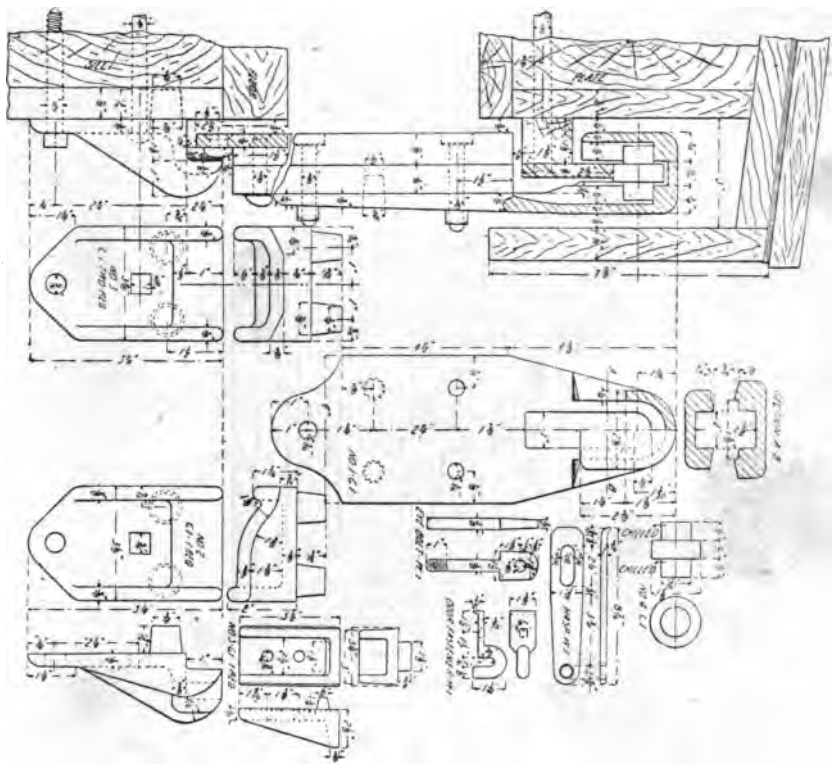
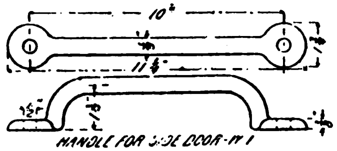


PLATE No. 36.

SIDE DOOR AND FIXTURES FOR BOX CARS



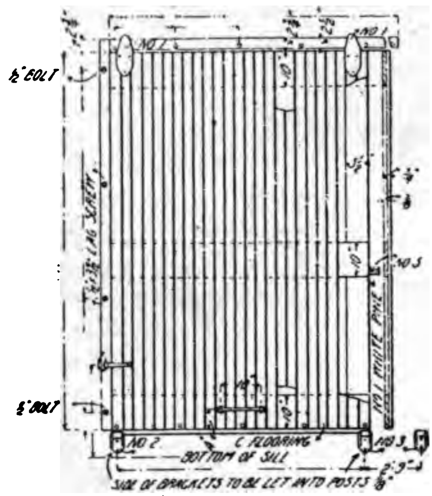


PLATE No. 36A.

END DOOR AND FIXTURES FOR BOX CARS

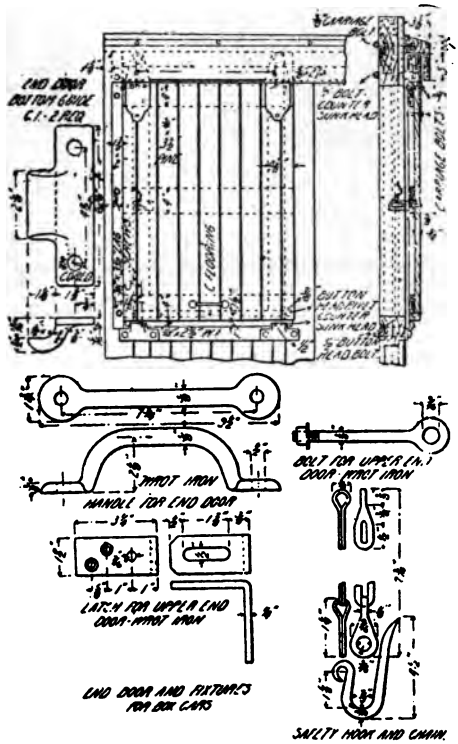


PLATE No. 37.

ST. LOUIS FLUSH CAR DOOR

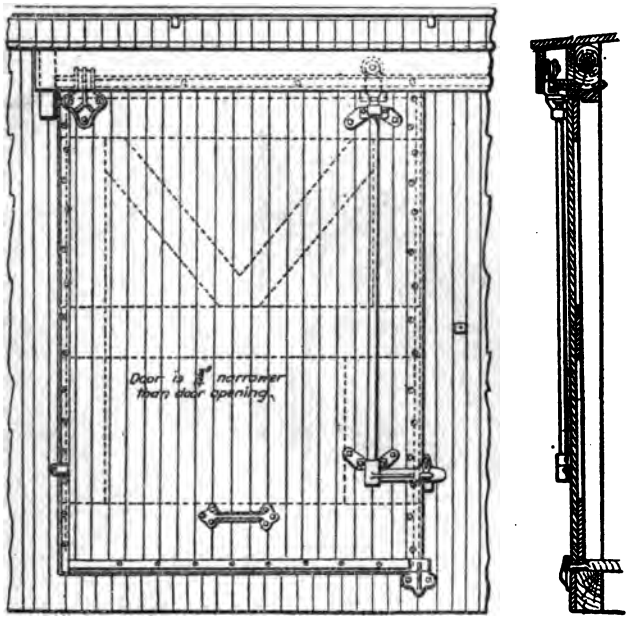


PLATE No. 38.

WESTERN FLUSH DOOR

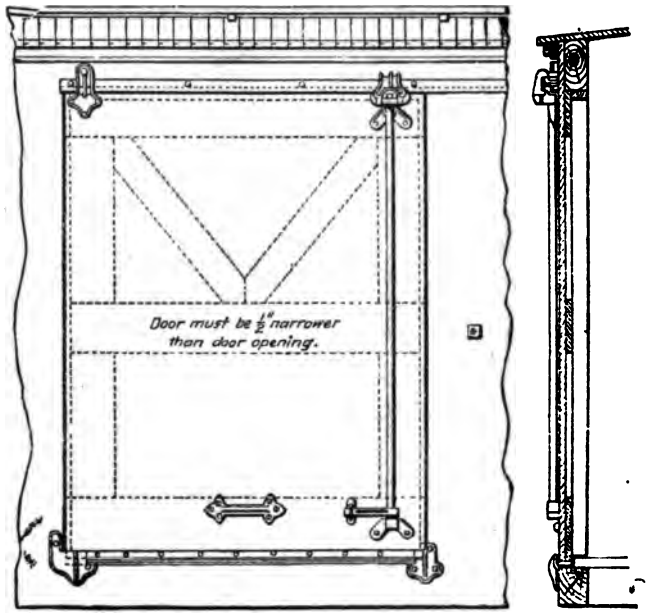


PLATE No. 39.

Western Railway Equipment Co. St. Louis, Mo.

JONES CAR DOOR

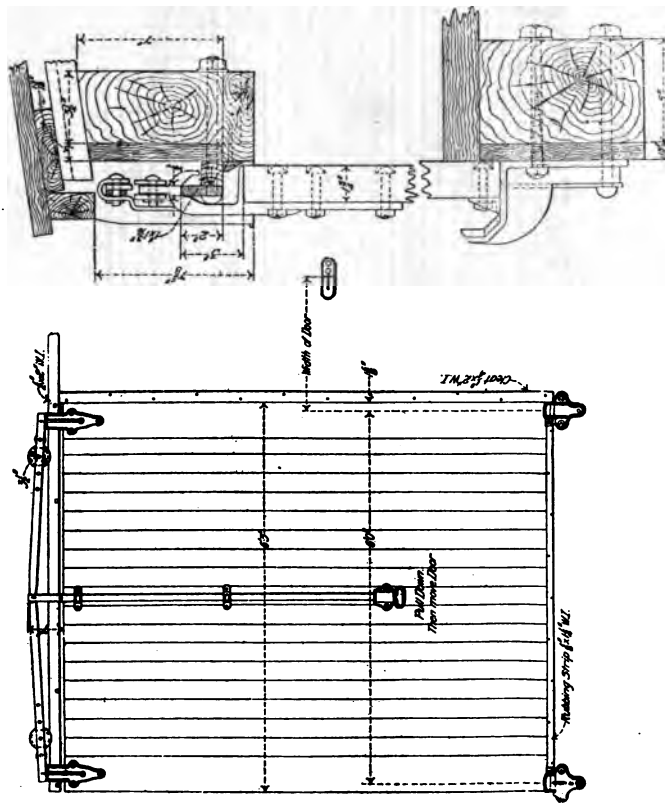


PLATE No. 40.
Jones Car Door Co., Chicago, Ill.

DETROIT CAR DOOR

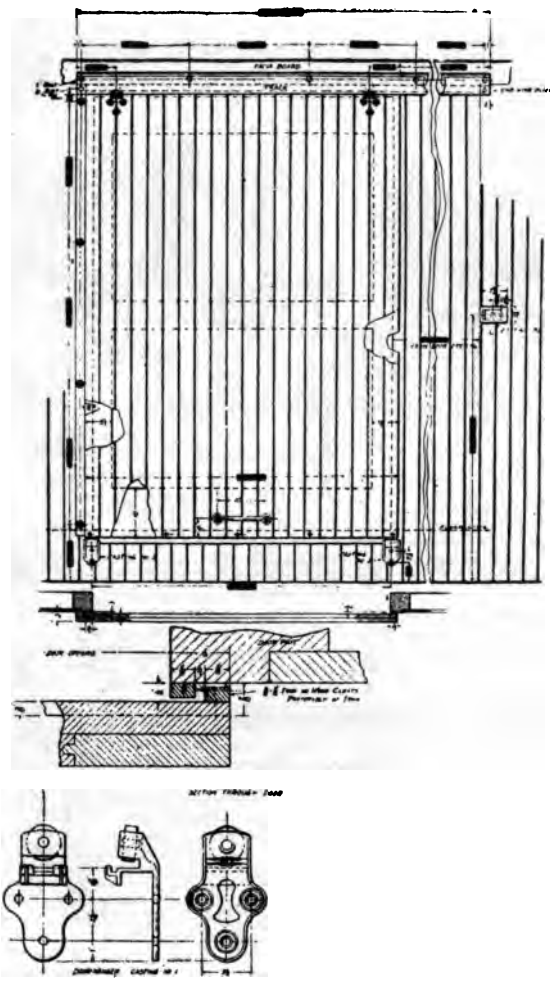


PLATE No. 41.

Hutchins Car Roofing Co., Detroit, Mich.

DETROIT CAR DOOR

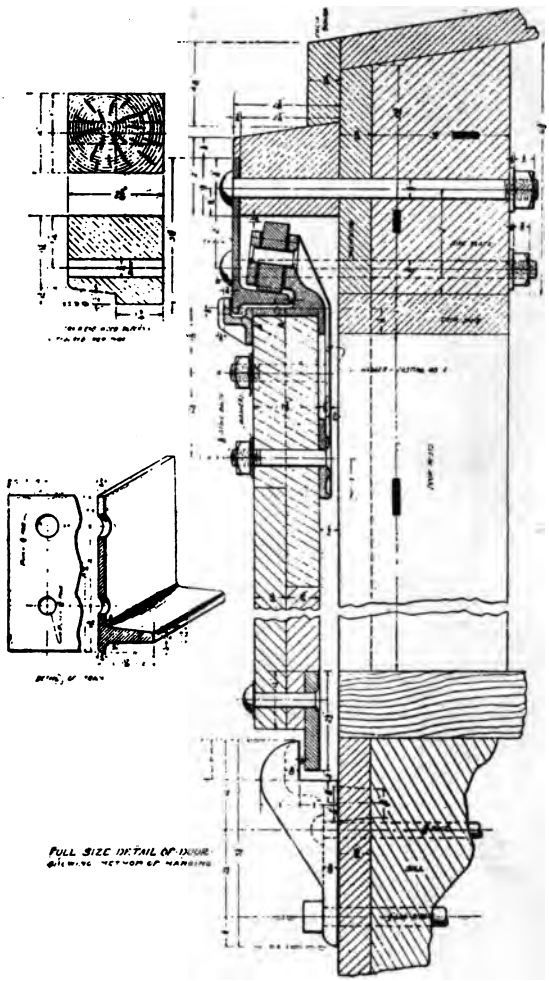


PLATE No. 41A.

Hutchins Car Roofing Co., Detroit, Mich.

SECURITY CAR DOOR

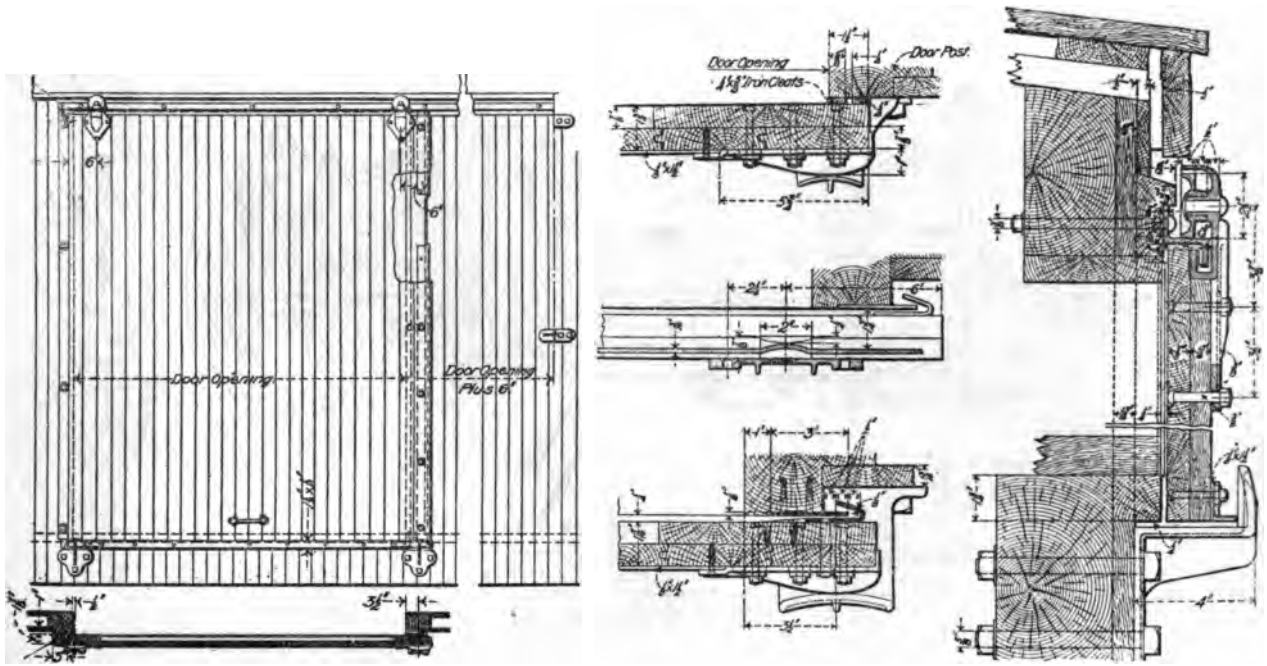


PLATE No. 42.
The Camel Co., Chicago, Ill.

GRAIN DOORS, as the name implies, are used when a shipment of grain is placed in the car, and are so constructed that they can be placed across the side door opening to form a continuation of the inside lining. (See Plate 1, Fig. 143). Nearly all the grain doors in general use today are protected by

CHICAGO GRAIN DOOR

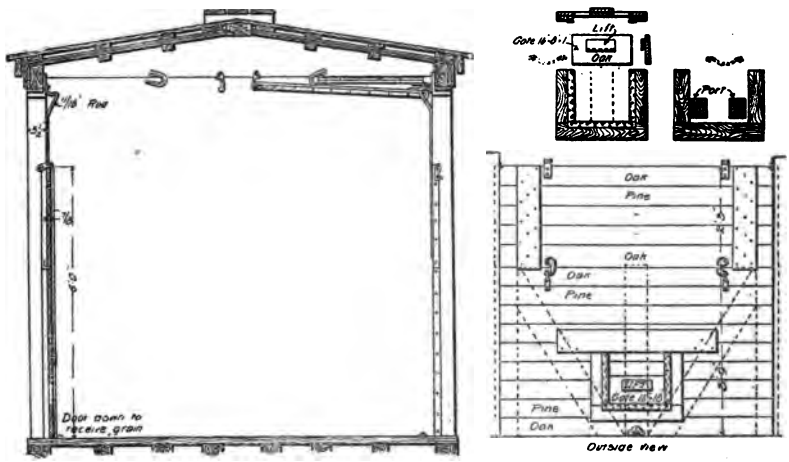


PLATE No. 44.

patents, and like the side doors they are quite numerous. The proper manner of constructing and attaching a grain door to the car, seems to be quite difficult, for, in spite of all that has been done, they are continuously being destroyed, or torn from their fastenings and lost. See Plate 44.

CHAPTER IV.

BRAKE SHAFTS AND SAFETY APPLIANCES.

HEIGHT OF BRAKE STAFF—In 1907 a standard maximum height of brake staff, for standard box cars, from top of rail to top of brake staff of 14 feet, was adopted.

There are certain requirements by law and recommended practices of the M. C. B. Association, which are closely followed in the construction of all classes of cars.

In 1893 a Recommended Practice was adopted on safety appliances under the subheads as given. In 1896 some changes were made, especially in regard to handholds, and by the elimination of various details from drawing. In 1902 it was changed to Standard.

In 1905 the same was revised to more clearly define the location of safety appliances on cars. Also, the lower round of the end ladder with wooden rails was made straight instead of having an offset.

In 1906 the position of the brake shaft and location of roof handholds were modified.—Proceedings 1906.

In 1907 a Sheet was devoted entirely to illustrating these standards.

In 1908 a thorough revision was made of both text and drawings in order to make their meaning and intent clear and adaptable to all existing types of car equipment, and to be capable of but one interpretation.

SAFETY APPLIANCES.—FREIGHT TRAIN CARS.

PREFACE.

Cars of construction not covered specifically in the following sections, relative to handholds, sill steps and ladders, and not shown by the drawings in Plates 47, 48 and 49, shall be considered as of special construction but shall have the same complement of handholds, sill steps and ladders as are required for cars of the nearest approximate type.

BRAKE SHAFTS.

(1) The brake shaft to be located on the end of car, preferably to the left of the center thereof, when facing the end of car.

(2) On cars without fixed ends the location of brake shafts to be suitable to the car construction and operation.

(3) The rachet wheel to be secured from turning on the brake shaft.

(4) The brake pawl to be fastened to a suitable casting or plate attached to the car body or brake step.

RUNNING BOARDS.

(1) Box and other house cars to be provided with running boards on roof, not less than 18 inches wide.

(2) Longitudinal running boards on tank cars used in connection with safety railings to be not less than 10 inches. Running boards will not be required on tank cars having floors .

(3) The ends of all running boards which project more than four inches over the edge of roof of ends of cars to be properly supported.

SILL STEPS.

(1) One substantial sill step to be secured to each side of car at the lower right-hand corner, this being the corner on the right, when facing the side of car. The side of the sill step next to the corner to be as near as practicable to the end of the car.

(2) Sill steps to be made of wrought iron or steel about ⅝ by 1½ inches cross section area or equivalent.

(3) Sill steps to be about 12 inches long between the sides, measured horizontally at the tread.

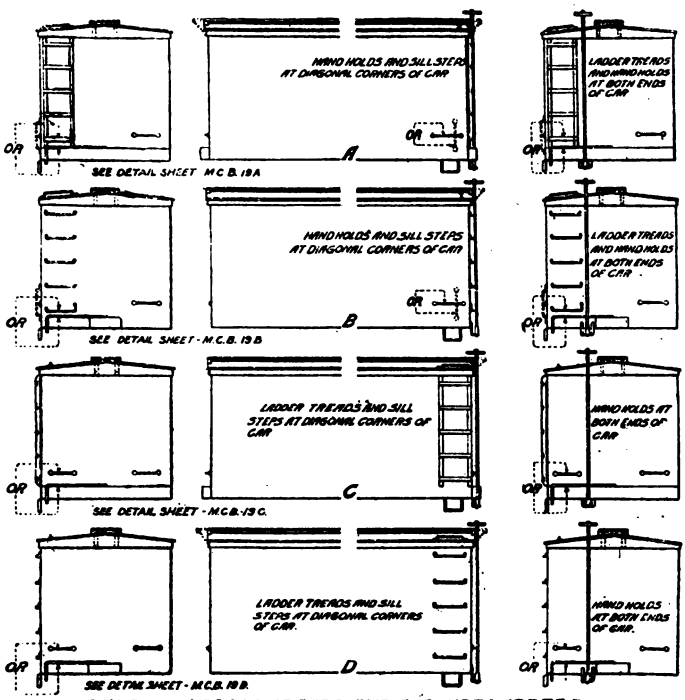
(4) The lower treads of sill steps to be about 24 inches and not more than 32 inches above the rail, the clear depth of sill steps to be not less than 6 inches.

(5) Sill steps exceeding 18 inches in depth to have an addi-

tional tread above the lower tread, and such sill steps to be laterally braced.

(6) Each side of sill steps on cars to be securely fastened by means of lag screws, bolts or rivets.

PLATE No. 47.



BOX AND OTHER HOUSE CARS, END AND SIDE LADDERS.

LADDERS.

(1) Box and other house cars and all cars, the top of which can not be reached from sill steps or platform end sills, shall have two wrought iron or wooden ladders.

(2) Ladders to be located at diagonal corners, on right-

hand end of sides of cars or left-hand side of ends of cars. When cars have platform end sills, ladders may be located near center of ends of cars. High side gondola cars with fixed ends having brake staff platform at one end of car may have ladders and sill steps on both sides at same end of car, provided this arrangement does not conflict with the rule regarding sill steps and handholds at diagonal corners of cars.

(3) Ladder treads of wrought iron or steel, to be of ⅝ inch nominal diameter; or of hardwood, to be nominally 1½ by 2 inches, about 16 inches clear length.

(4) The spacing of treads of ladders to be about 18 inches.

(5) All ladder treads shall have a minimum clearance around them of 2 inches, nominal clearance 2½ inches.

(6) When wrought iron or steel ladders without sides are placed on ends of cars with non-projecting end sills, the bottom treads to have a guard or upward projection at inside ends.

(7) Tank cars having running boards to be provided with suitable ladders to give access to the running boards; the ladders to be located on right-hand end of sides of cars or left-hand side of ends of cars when running boards are continuous around the car. If running boards are not continuous, ladders to be so located as to give access to each end of each running board. Treads of ladders to be spaced about 18 inches apart.

(8) Arrangements of ladders are shown in A, B, C, and D, Plate 47.

HANDHOLDS.

(1) Box and other house cars shall have handholds on roofs, in line with each ladder, running parallel with the ladder treads.

(2) Roof handholds to be placed not less than 2 inches nor more than 18 inches from the edge of the roof and the length to be not less than 10 inches in the clear, unless the construction of the car will not permit.

(3) *Box and other house cars with end ladders* to be provided with a horizontal or vertical handhold, 16 inches in the clear or longer, on each side of each car over sill step; if horizontal side handholds are used they shall be located not more than 30 inches above center line of coupler.

(4) Each end of car to be provided with two horizontal handholds, not less than 12 inches, and preferably 16 inches in the clear, or longer, located not over 30 inches above center line of coupler, or placed under the end sill as near the face as will insure a good, safe fastening, or, if preferred, may be placed on the face of end sill. The coupler unlocking rod, the tread

of the ladder or any suitably located part of the car which does not exceed two inches, on each side or in diameter, and has the proper clearance, will be considered a suitable end handhold.

(5) Arrangement of handholds is shown in Plate 47, A and B.

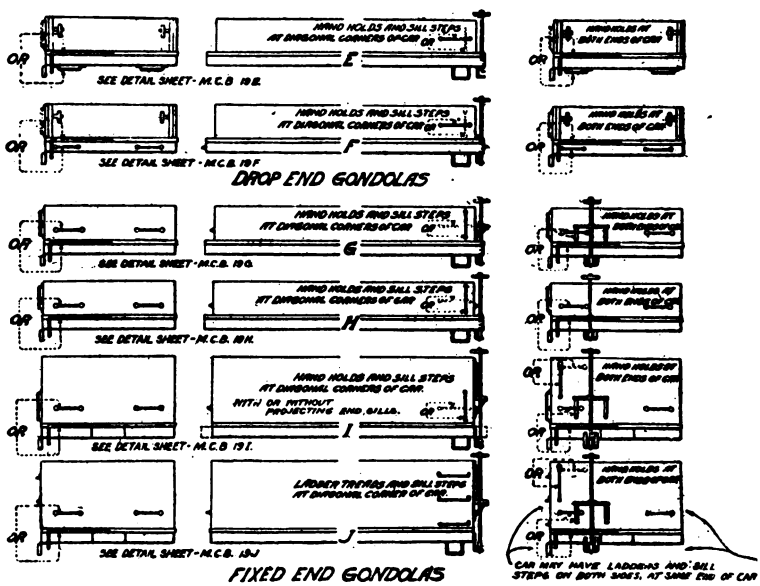
(6) *Box and other house cars having side ladders* located over sill steps, a tread of such ladder, not over 30 inches above center line of coupler, is an effective handhold.

(7) Each end of car to be provided with two horizontal handholds, not less than 12 inches, and preferably 16 inches in the clear, or longer, located not over 30 inches above center line of coupler or placed under the end sill as near the face as will insure a good, safe fastening, or, if preferred, may be placed on the face of end sill. The coupler unlocking rod, or any suitably located part of the car which does not exceed two inches on each side or in diameter, and has the proper clearance, will be considered a suitable end handhold.

(8) Arrangement of handholds is as shown in Plate 47, C and D.

(9) *Gondola cars with drop ends* to be provided with a

PLATE No. 48.



horizontal or vertical handhold on each side of each car over sill steps, with as much clear length as the car construction will permit, provided same need not exceed 16 inches; and

(10) If horizontal side handholds are used they shall be located not more than 30 inches above center line of coupler.

(11) Gondola cars with drop ends to be provided with two end handholds not less than 12 inches, and preferably 16 inches in the clear, or longer, at each end of car, placed under the end sills as near face as will insure a good, safe fastening, and as shown in E, Plate 48.

(12) If preferred, the end handholds may be placed on the face of end sills, as shown on the alternate illustration, Plate 48-F.

(13) The coupler unlocking rod when properly located and having proper clearance around it under all conditions, including projecting loads, will be a suitable end handhold.

(14) *Gondola cars with fixed ends* to be provided with a horizontal or vertical handhold, on each side of each car over sill steps, with as much clear length as car construction will permit, provided handholds need not exceed 16 inches in length; and

(15) If horizontal handholds are used they shall be located not more than 30 inches above center line of coupler.

(16) Gondola cars without projecting end sills, having ladders located on sides, to have one vertical or horizontal handhold at upper corner of left-hand side of brake end of car.

(17) Vertical handhold to extend downward from about 4 inches from top of car; horizontal handhold located about 6 inches from top of car.

(18) Each end of each car to be provided with two horizontal handholds not less than 12 inches, and preferably 16 inches in the clear, or longer, located not over 30 inches above the center line of coupler or placed under the end sill as near as will insure a good, safe fastening, or, if preferred, may be placed on the face of the end sill. The coupler unlocking rod, when properly located, and having proper clearance around it, is a suitable end handhold.

(19) Exception to be made when the car is provided with a brake step, in which case the bracket of the brake step, if of suitable height, may be used as a handhold on that side of the end of the car, as shown in G, Plate 48.

(20) The arrangement without brake step is shown in H, Plate 48.

(21) High cars with vertical end handholds are shown in I, Plate 48.

(22) High cars with horizontal side handholds are shown in J, Pate 48.

(23) *All tank cars* to have safety railing for each running board, not less than 30 inches and not more than 5 feet above platform or above running board. Hand railing may be on the outside of running board, secured to side frame, or may be on the inside of running board, secured to tank or tank bands; or, in case of there being one overhead running board, the hand railing may be secured to top of tank, or tank bands.

(24) Tank cars with end platforms and without hand railings extending around the ends of the tank to have a horizontal handhold of as much length in the clear as the diameter of the tank will permit, secured to each head and located not less than 30 inches and not more than 5 feet above platforms.

(25) Tank cars to be provided with horizontal or vertical handhold, 16 inches in the clear or longer, on each side of each car over sill steps. Tank cars having safety railings secured to the tank to be provided wtih an additional vertical handhold attached to the tank.

(26) Tank cars provided with side safety railings, supported by posts which are not more than 2 inches on each side or 2 inches in diameter; the posts are suitable side handholds if located over sill steps.

(27) Tank cars to be provided with two horizontal end handholds, not less than 12 inches, and preferably 16 inches in the clear, or longer, located not over 30 inches above the center line of coupler, and,

(28) If preferred, the end handholds may be placed on the face of the end sills or under the end sills as near the face as will insure a good, safe fastening. The coupler unlocking rod, when properly located and having proper clearance around it, is a suitable end handhold.

(29) Tank cars with side platform and hand railings secured to side frame to have handholds, as shown in K, Plate 49.

(30) Tank cars without end sills, the end handholds may be secured to tank heads, or to end running boards on cars so equipped, as shown in L, Plate 49.

(31) Tank cars without through side sills but having running boards and safety railings secured to tank or tank bands to have handholds, as shown in M, Plate 49.

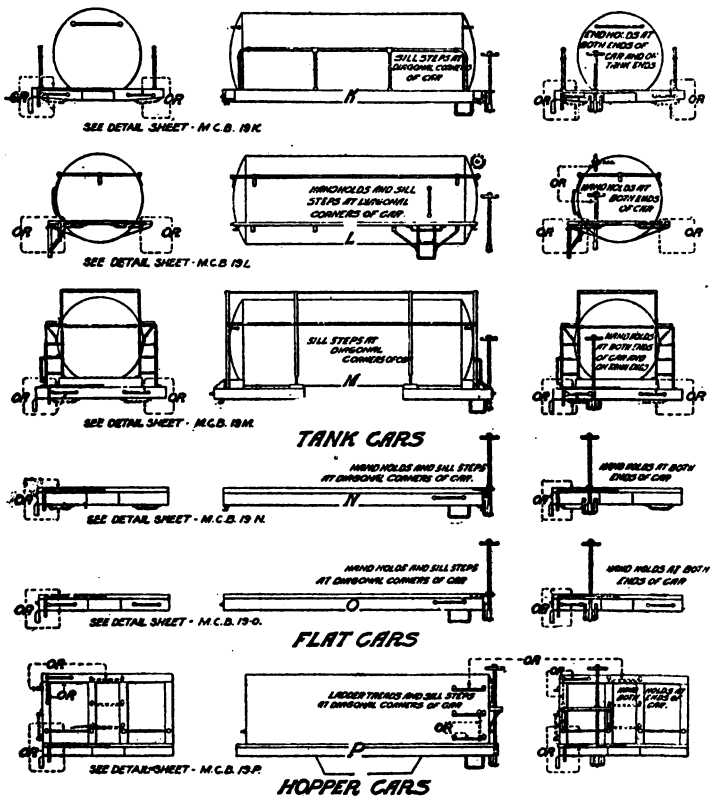
(32) *Flat Cars* to be provided with a horizontal handhold on each side of each car over sill steps, with as much clear length as the car construction will permit, provided same need not exceed 16 inches.

(33) Flat cars to be provided with two end handholds not less than 12 inches, and preferably 16 inches in the clear, at each

end of car; placed under the end sills, as near the face as will insure a good, safe fastening, and as shown in N, Plate 49; or,

(34) If preferred, the end handholds may be placed on the face of the end sills, as shown on the alternate illustration, O, Plate 49; or,

PLATE No. 49.



(35) The coupler unlocking rod, when properly located and having proper clearance around it under all conditions, including projecting loads, will be a suitable end handhold.

(36) *Hopper cars* to be provided with horizontal or vertical handholds on each side of each car over sill steps, with as much clear length as the car construction will permit, provided handholds need not exceed 16 inches length in the clear.

(37) If horizontal handholds are used, they shall be located not more than 30 inches above center line of coupler.

(38) Hopper cars without platform end sills, having ladders located on sides, to have one vertical or horizontal handhold at upper corner of left-hand side of brake end of car.

(39) Vertical handhold to extend downward from about 4 inches from top of car; horizontal handhold located about 6 inches from top of car.

(40) Each end of hopper cars to be provided with two horizontal handholds not less than 12 inches, and preferably 16 inches in the clear, or longer, located not over 30 inches above center line of coupler, or placed under the end sill as near the face as will insure a good, safe fastening, or, if preferred, may be placed on the face of end sill. The coupler unlocking rod, or a tread of ladder, when properly located and having proper clearance around it, is a suitable end handhold.

(41) Exception to be made when the car is provided with a brake step, in which case the bracket of the brake step, if of suitable height, may be used as a handhold on that side of the end of car.

(42) Arrangement of handholds is shown in P, Plate 49.

CABOOSE CARS.

(43) *Caboose cars* having end platforms, the platform railings and posts will be effective handholds.

(44) Caboose cars not having end platforms to be equipped with side and end handholds, same as described for box and other house cars.

(45) Caboose cars having side doors, to have vertical handholds on each door post and suitable steps below doorway.

(46) Curved hand railings located so as to facilitate catching caboose cars under motion will be considered as suitable handholds.

STEPS, HANDHOLDS AND LADDER TREAD FASTENINGS, DIMENSIONS AND CLEARANCES.

(1) All handholds and ladder treads applied on wood to be secured by through bolts or lag screws.

(2) When bolts are used, they should be not less than ½ inch diameter, with nuts on the outside wherever possible, and riveted over.

(3) When lag screws are used, they should be not less than ½ inch diameter, 3 inches long, and screwed full length into the wood.

(4) When rivets are used, they should be not less than ½-inch diameter.

(5) All handholds and ladder treads shall have a minimum clearance around them of 2 inches, nominal clearance 2½ inches.

(6) All handholds and ladder treads made of wrought iron or steel to be of ⅝ inch nominal diameter, or larger.

(7) The coupler unlocking rod, if properly located and having a minimum clearance of 2 inches around it will be a suitable end handhold.

(8) Brake step brackets, if properly located and not more than 30 inches above center line of coupler, will be suitable end handholds.

RULES FOR INSPECTION OF SAFETY APPLIANCES

AND FOR PROCURING

EVIDENCE OF VIOLATIONS

OF THE

SAFETY APPLIANCE LAWS

INTERSTATE COMMERCE COMMISSION

SEPTEMBER 1, 1907
AND
MARCH 1, 1909

Rules for Inspection of Safety Appliances, with Classification of Defects to be Reported.

1. In all inspections, excepting those intended to secure evidence of violation of the law, inspector should make himself known to the foreman or other official of the mechanical department, or, in the absence of that officer, to the agent or other employee next in authority. In all cases have name and title of such officer or employee included in report of inspection. Whenever practicable, the official found in charge should be invited to accompany or send a representative with the inspector, and the person so accompanying the inspector should have his attention drawn to all defects noted. The time of making inspections is to be shown on each report.

2. Report location of curves in yards and sidings on which M. C. B. coupler will not couple or remain coupled, the prac-

tice generally followed where such curves exist, and whether any special device is employed.

3. Report in detail air-brake practice.

4. File report of make-up of freight trains and per cent of air in use on blanks provided for that purpose.

5. Special attention should be given to grab irons on roofs of cars, and when reporting loose grab irons state whether attached with lag screws or bolts and to a substantial part of car frame.

6. As loose hand holds and grab irons may originate in car shops, observe closely new cars and those lately out of shop. Report all defects found in running boards and ladders.

7. State fully all particulars of any other than the M. C. B. type of coupler found on cars of all kinds.

8. Note on report of defective cars whether your inspection was made prior to inspection by railway's inspector, and, if possible, show disposition of cars found defective.

Defects in Couplers and Parts.

1. Coupler body broken.
2. Knuckle broken.
3. Knuckle pin broken.
4. Lock block broken.
5. Lock block bent. (See footnote *A*.)
6. Lock block wrong. (See footnote *A*.)
7. Knuckle pin wrong. (See footnote *A*.)
8. Lock block worn. (See footnote *B*.)

9a. Coupler worn. (As per M. C. B. limit gauge.) (See footnote *B*.)

9b. Knuckle worn. (As per M. C. B. limit gauge.) (See footnote *B*.)

10. Guard arm short.

11a. Knuckle missing.
11b. Lock block missing.
11c. Knuckle pin missing.
11d. Lock-block key missing.
11e. Lock-block trigger missing.

11f. Lock set missing.
12. Lock block inoperative.
13. Knuckle pin bent.

FOOTNOTES.

A. Nos. 5, 6, and 7 are defects only when interfering with safe operation.

B. Nos. 8, 9a, and 9b are defects only when worn sufficiently to destroy contour line by allowing lost motion to approach the danger point as shown by M. C. B. limit gauge.

Defects in Uncoupling Mechanism.

14. Lock link broken.
21. Uncoupling lever broken.
22. Uncoupling chain broken.
23. End lock, or casting, broken.
23x. End lock, or casting, incorrectly applied.
24. Keeper broken.
24x. Keeper incorrectly applied.
25. Uncoupling lever bent. (See footnote *A*.)
26. Uncoupling chain too short.
27. Uncoupling chain too long.
28. End lock, or casting, loose. (See footnote *B*.)
29. Keeper loose. (See footnote *B*.)
30. End lock, or casting, wrong. (See footnote *C*.)
31. Keeper wrong. (See footnote *C*.)
32a. Uncoupling lever incorrectly applied. (See footnote *D*.)
32b. Uncoupling lever wrong. (See footnote *E*.)
33a. Uncoupling lever missing.
33b. End lock, or casting, missing.
33c. Keeper missing.
33d. Uncoupling chain missing.
33h. Lock link missing.
34. Uncoupling chain kinked.
35. End lock, or casting, bent.
36. Keeper bent.
39. Angle clip loose.

FOOTNOTES.

A. No. 25 is a defect when interfering with proper operation of uncoupling lever.

B. Nos. 28 and 29 are defects when the proper operation of the uncoupling mechanism is interfered with.

C. Nos. 30 and 31 are defects when interfering with proper operation of an uncoupling lever.

D. No. 32a. Under this head include all uncoupling levers which are too close to car or parts of car. Give details.

E. No. 32b. Under this head include all uncoupling levers which are too long or too short. Give details.

Defects in Visible Parts of Air Brakes.

41. Triple-valve casting defective.
42. Reservoir casting defective.
43. Cylinder casting defective.
44. Cut-out cock defective. (Give particulars.)
45a. Release cock defective.
45b. Release rod broken.
46. Angle cock defective.
47a. Train pipe broken.
47b. Train pipe loose.
48. Cross-over pipe defective.
49. Air hose defective.
50. Air-hose gasket defective.
51. Power-brake rigging defective. (Specify part.)
52. Retaining valve defective. (Give particulars.)
53. Retaining pipe defective. (Give particulars.)
54a. Pump missing.
54b. Driving-wheel brake missing.
54c. Triple valve missing.
54d. Train-pipe bracket missing.
54e. Cut-out cock handle missing.
54f. Hose missing.
54g. Hose gasket missing.
54h. Angle cock missing.

54i. Angle-cock handle missing.
54k. Retaining pipe missing.
54l. Retaining valve missing.
54m. Release cock missing.
54n. Release rod missing.
55. Air brake cut out.
56. Cylinder and triple not cleaned within twelve months. (Give date of last cleaning; or, if no date is stenciled on cylinder or triple valve, use words "no date.')
57. Power driving-wheel brake, Locomotive not equipped with.
58. Power train brakes, Locomotive not equipped with appliances for operating.
65. Cylinder loose.
66. Reservoir loose.
70. Air-hose coupling defective. (Give particulars.)

Defects in Handholds.

81. End handhold missing.
81x. Side handhold missing.
82. Handhold incorrectly applied. (See footnote *A*.)
83. Handhold bent.
84. Handhold broken.
85. Handhold loose.

FOOTNOTE.

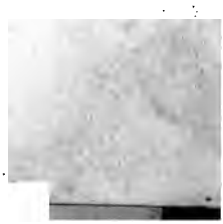
A. Application of handholds and grab irons should be governed by recommended practice of the M. C. B. Association, as far as same complies with law.

A standard location for these parts is essential for safe operation at all times, and especially at night.

Defects in Height of Couplers.

(For standard height of coupler, see page 73.)

91. Coupler too high; empty car.
92. Coupler too low; empty car.
93. Coupler too low; loaded car.
94. Coupler too high; loaded car.
95. Carrier iron loose.



Defects in Steps.

96. Sill step bent.
97. Sill step loose.
98. Sill step broken.
99. Sill step missing.
100. Sill step incorrectly applied.

Defects in Ladders.

110. Ladder round bent.
111. Ladder round broken.
112. Ladder round loose.
113. Ladder round missing.
114. Ladder incorrectly applied. (Give particulars.)
115. Ladder loose.

Defects in Roof Hand Holds.

119. Roof handhold bent.
120. Roof handhold incorrectly applied.
121. Roof handhold loose.
122. Roof handhold missing.
123. Roof handhold broken.
124. Top handhold incorrectly applied.
125. Top handhold loose.
126. Top handhold missing.
127. Top handhold broken.

Instructions Regarding Violations of the Safety-Appliance Laws.

The object of these instructions is to call the attention of inspectors to certain rules to be observed in obtaining evidence upon which the Government can successfully prosecute. Inspectors should enter upon the investigation of every case in a spirit of fairness and with a desire to perform their whole duty as officials of the Government, directed to aid in the execution and enforcement of the law. If necessary to the success of any investigation of this character, inspectors need not disclose their identity.

The necessity of obtaining definite information in regard to each violation can not be too thoroughly impressed upon all. Bear in mind that one case fully presented, with all important details covered, is worth hundreds prepared in a slipshod manner with some essential detail omitted. When cases are improperly prepared neither the Commission nor United States attorneys can act efficiently.

All the information hereinafter specified, so far as applicable to any given case, should be obtained, and all facts not covered by these instructions, but which appear to have bearing on the case, should be reported.

The word "car," as used herein, is a term of general application and refers, as the context may indicate, to any or all vehicles running on rails, including locomotives, tenders, cabooses, steam shovels, and other rolling stock.

When a car is found without safety appliances or with safety appliances in defective condition, contrary to the law, if a part of a train, ascertain whether the particular car is loaded with freight in process of transportation from one State to another, and also whether there are other cars in the train so loaded. Give the points of shipment and final destination of such interstate freight and the character thereof, and copy any shipping tags or other notices on cars.

Do not rely solely upon your own observation if additional evidence is obtainable. It is desirable to have other witnesses, whose names should be obtained by the inspector or inspectors making the report, and whose attention should be called *at the time* to the precise defect amounting to a violation.

DRIVING-WHEEL BRAKES

The absence from the locomotive of driving-wheel brakes is in violation of the statute:

When a locomotive is found not equipped with such brakes, ascertain all the facts connected therewith; length of time in such condition and whether used regularly in service.

Absence from locomotives of appliances for operating train brakes is likewise a violation of the statute.

TRAIN BRAKES.

Reports should be made of all trains which have less than 75 per cent of the train brakes on the cars of such trains used and operated by the engineer of the locomotives drawing such trains; and it should also be borne in mind that all power-braked cars in such trains which are associated with said 75 per cent must have their brakes so used and operated, and that there must be a *sufficient* number of cars in each train so equipped with power or train brakes that the engineer on the locomotive drawing such train can control its speed without requiring brakemen to use hand brakes for that purpose.

AUTOMATIC COUPLERS.

The essential requirements of the law are:

First, that couplers shall couple automatically by impact. The absence of automatic couplers which will couple by impact, or the use of an automatic coupler which, owing to its defective condition, can not be so operated, is clearly a violation of the law.

Second, the law prohibits the use of couplers that can not be uncoupled without the necessity of men going between the ends of the cars.

The coupler should have an uncoupling mechanism, applied and maintained so that the cars can be separated without disobeying this requirement of the law.

If an inspector sees an employee go between the ends of cars, investigation should at once be made to discover for what purpose he does so.

HEIGHT OF COUPLERS.

On standard-gauge roads the maximum height is 34½ inches, measured from level of tops of rails to the center of the coupler body or corresponding line in coupler head. Greatest variation allowed from such standard height between couplers of empty and loaded cars is 3 inches.

On narrow-gauge roads the maximum height is 26 inches;

extreme variation allowed between couplers of empty and loaded cars is 3 inches.

Inspectors must exercise judgment in determining defects of this class. See that car is standing on an approximately level track before measurements are taken.

Minimum height for loaded or empty cars, standard gauge, is 31½ inches. An empty car having a coupler 31½ inches high is defective, because when loaded it must fall below the minimum of 31½ inches.

Couplers must conform to these heights in order to meet the requirements of law.

HANDHOLDS OR GRAB IRONS.

Report all cars not equipped with grab irons or handholds on both ends and sides.

Note in this connection that the use of the words "handholds in the ends and sides of each car" requires at least two grab irons or handholds on each end and on each side of the car.

Owing to the fact that there is not incorporated in the law any specific location for handholds or grab irons, it is believed that a successful prosecution could only be maintained where such devices are either missing or broken or badly bent.

CHAPTER V.

DRAFT GEARS, DRAFT TIMBERS, COUPLERS AND ATTACHMENTS.

DRAFT GEAR AND ATTACHMENTS—When these terms are used in connection with the construction of freight car equipment, they mean the draft timbers or their substitutes, automatic couplers and their attachments. It is by the means of the draft gears and couplers that cars are coupled together and made to form trains. Not only does the safe movement of trains depend upon it, but the coupling and uncoupling of cars, which also carries with it a certain degree of danger to human life. The very best car builders and manufacturers of car appliances have put forth every effort to make this part of the freight car construction one of strength and simplicity. The United States Government by an act of Congress, has made it a Penalty Defect, under the "Safety Appliance Acts," which provides among other things, that "it shall be unlawful for any Common Carrier to haul or permit to be hauled or used on its line, any car used in moving interstate traffic not equipped with couplers, Coupling Auto-

matically by impact and which can be uncoupled without the necessity of men going betwen the ends of the cars." The law also provides for the fixing of a standard height for couplers for freight cars, which are: Standard gauge roads 34½", Narrow gauge roads, 26"; maximum variation between loaded and empty cars, 3".

DRAFT TIMBERS—The purpose of the Draft Timbers is to carry the Coupler housings or Draft Gears and transmit the pull and stress to the car body.

There are always two of these timbers and they extend from the deadwood to the body bolster or beyond.

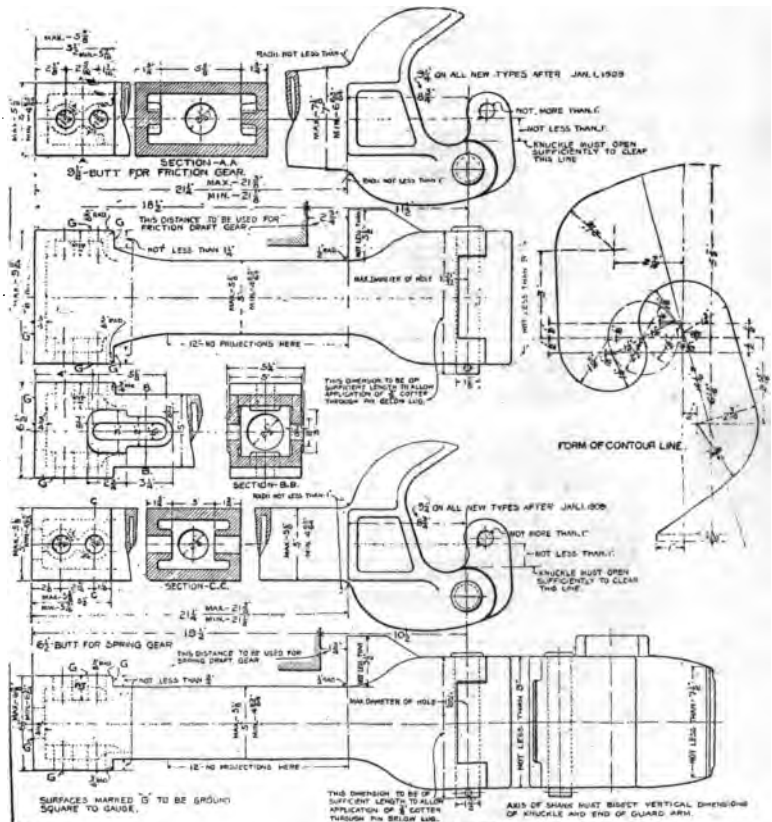
When wood is used they are made of white oak, the dimensions varying according to the character and capacity of the car. See Plate 1, Fig. 73.

With steel cars these timbers are called draft sills and are made of the same material as the remainder of the underframing, and at times they are entirely omitted on such cars, the coupler housing then being attached directly to the center sills.

COUPLERS AND ATTACHMENTS—The automatic coupler was first installed to facilitate the handling of cars, also for reason of safety to trainmen, and later same was made compulsory by an Act of Congress. The Standard Automatic Coupler as adopted by the M. C. B. Association is shown in Plate No. 52.

From this plate it will be readily seen that a vast improvement has been made over the old link and pin coupler and if it had not been made com-

MASTER CAR BUILDERS' ASSOCIATION
STANDARD AUTOMATIC COUPLER
STANDARD CONTOUR LINE
STANDARD DRAFT GEAR STOPS

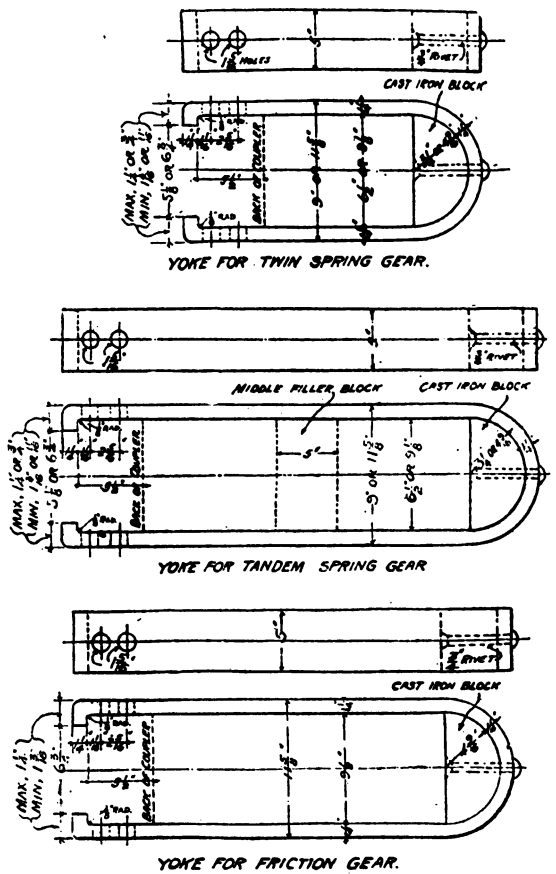


NOTE:- THE TOTAL LIFT OF LOCKING PIN SHALL NOT BE MORE THAN 6".
ALL COUPLERS MUST HAVE A 1⅛" EYELET FOR LOCKING DEVICE LOCATED IMMEDIATELY ABOVE LOCKING PIN HOLE.
ON ALL NEW TYPES OF COUPLERS AFTER JANUARY-1-1909 MINIMUM THICKNESS OF FRONT FACE OF COUPLER TO BE 1⅛". THE DIMENSIONS FROM THE BACK OF BUTT TO INSIDE FACE OF KNUCKLE BE 30⅜ INCHES.
1⅛" RIVETS TO BE USED FOR ATTACHING YOKES TO COUPLER BUTTS WHEN KNUCKLE IS CLOSED, ITS CONTOUR MUST COINCIDE WITH CONTOUR OF HEAD.
COUPLERS MAY BE MADE WITH EITHER 9½" OR 6½" BUTTS REGARDLESS OF SIZE OF SHANK.

PLATE No. 52.

pulsory by the government, that an automatic coupler should be used, the increase of business which necessitated heavier cars, with speedier transporta-

PLATE No. 53.



tion of freight, would, no doubt, have brought about this or some similar improvement. It may also be added, that the increased capacity of cars naturally required, some improvement had to be made over the single spring gear of the old class of cars.

To overcome some of the above deficiencies the Master Car Builders' Association recently adopted a larger yoke (See Plate 53) and are discarding the single spring, they being considered inadequate for modern service.

It is generally understood that the resistance of any material is in proportion to its weight, and the square of its velocity. If, therefore, cars are twice as heavy and the speed several times greater, it follows that the resilient features of the draft spring or gear should have several times its first capacity. The ordinary strain in pulling and handling a car is

WESTINGHOUSE FRICTION GEAR

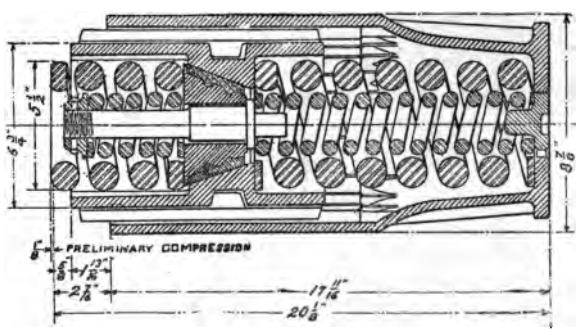


PLATE No. 55.
Westinghouse Air Brake Co., Pittsburgh.

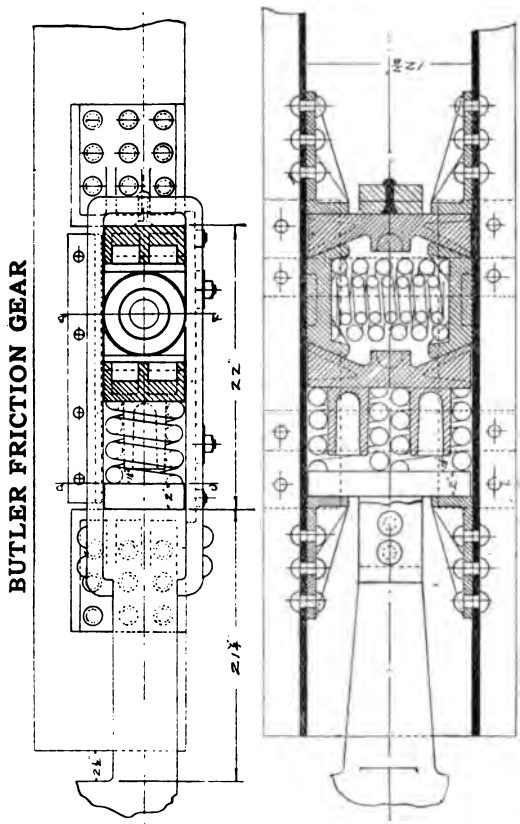
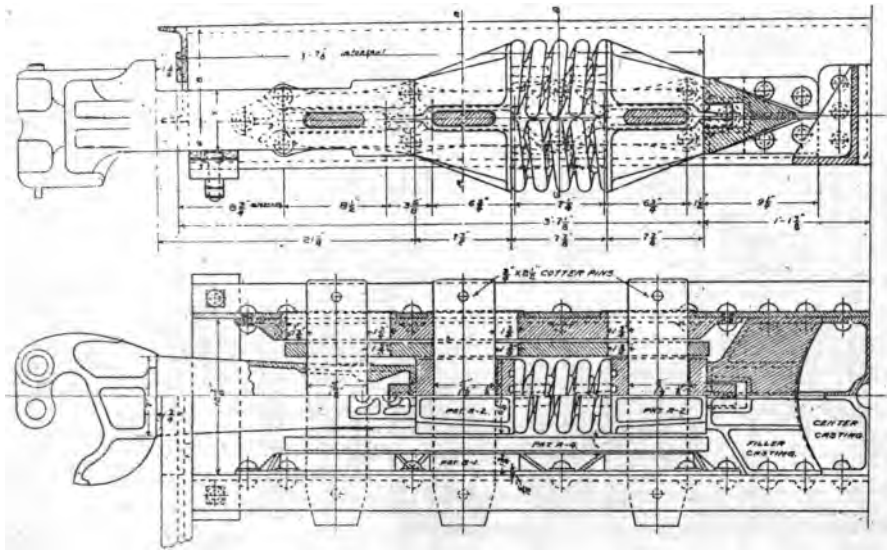


PLATE No. 56.

Butler Drawbar Attachment Co., Cleveland, Ohio.

FARLOW DRAFT GEAR TWIN SPRING AS APPLIED TO CHANNEL SILLS.



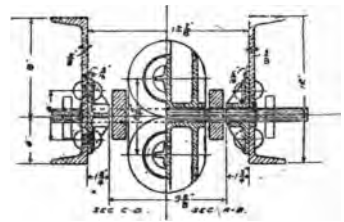
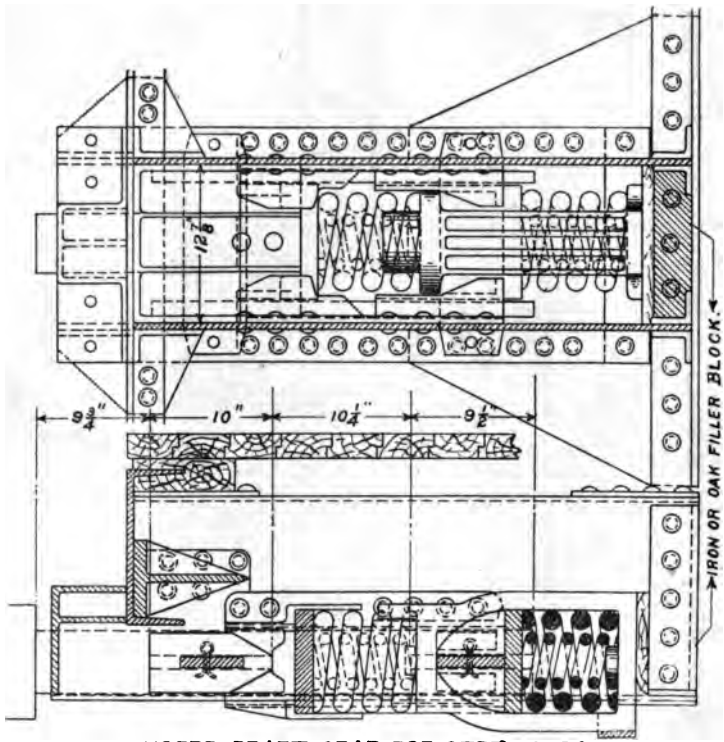


PLATE No. 57.

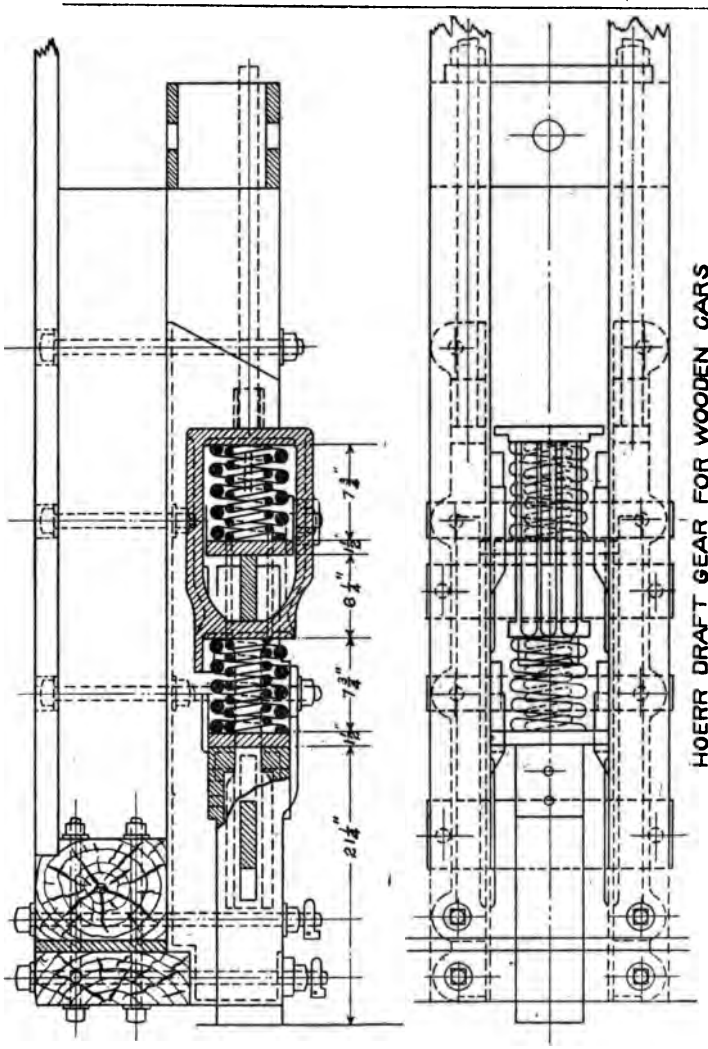
T. H. Symington Co., Baltimore, Md.



HOERR DRAFT GEAR FOR STEEL CARS

PLATE No. 58.

Western Railway Equipment Co., St. Louis, Mo.



HOERR DRAFT GEAR FOR WOODEN CARS

PLATE No. 59.

Western Railway Equipment Co., St. Louis, Mo.

REPUBLIC FRICTION DRAFT GEAR, APPLIED TO CAR WITH WOODEN SILLS

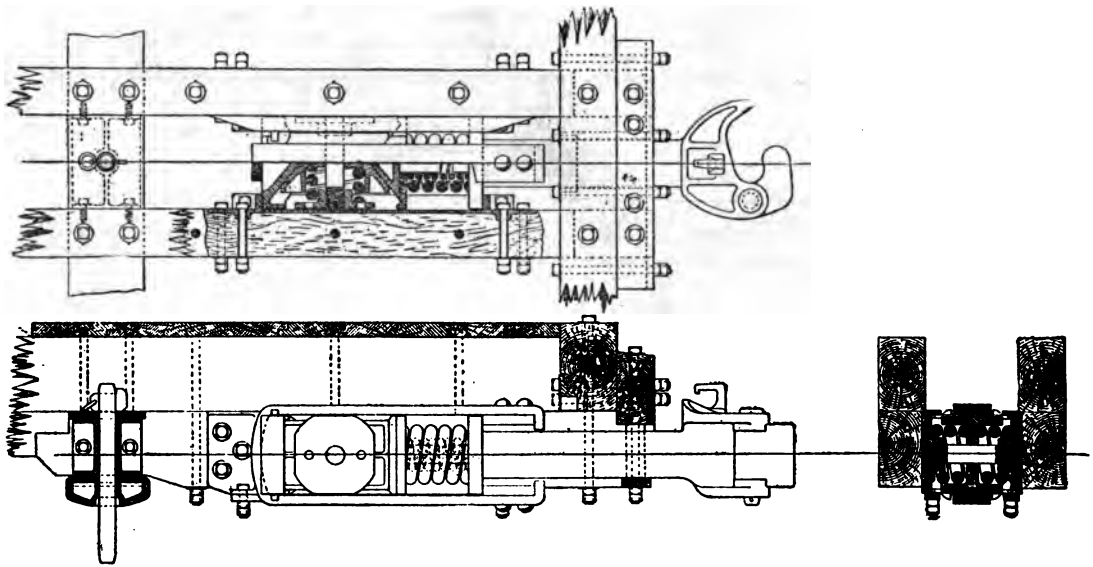
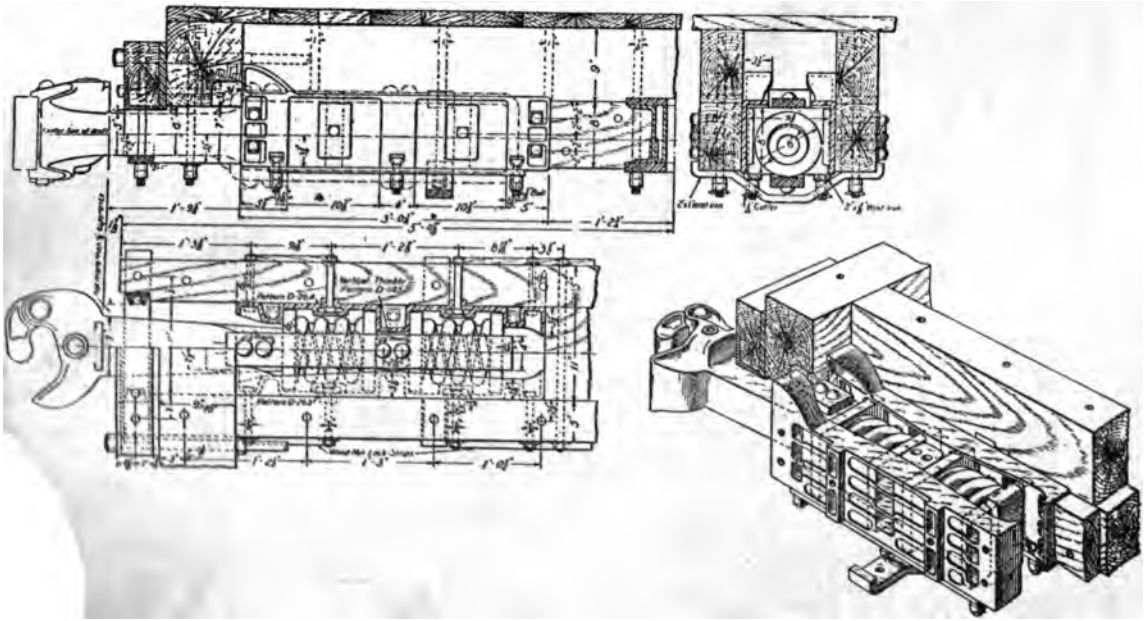


PLATE No. 60.
Western Railway Equipment Co., St. Louis, Mo.

MINER TANDEM DRAFT GEAR, AS APPLIED TO WOODEN CENTER SILLS



COUPLER CHART.

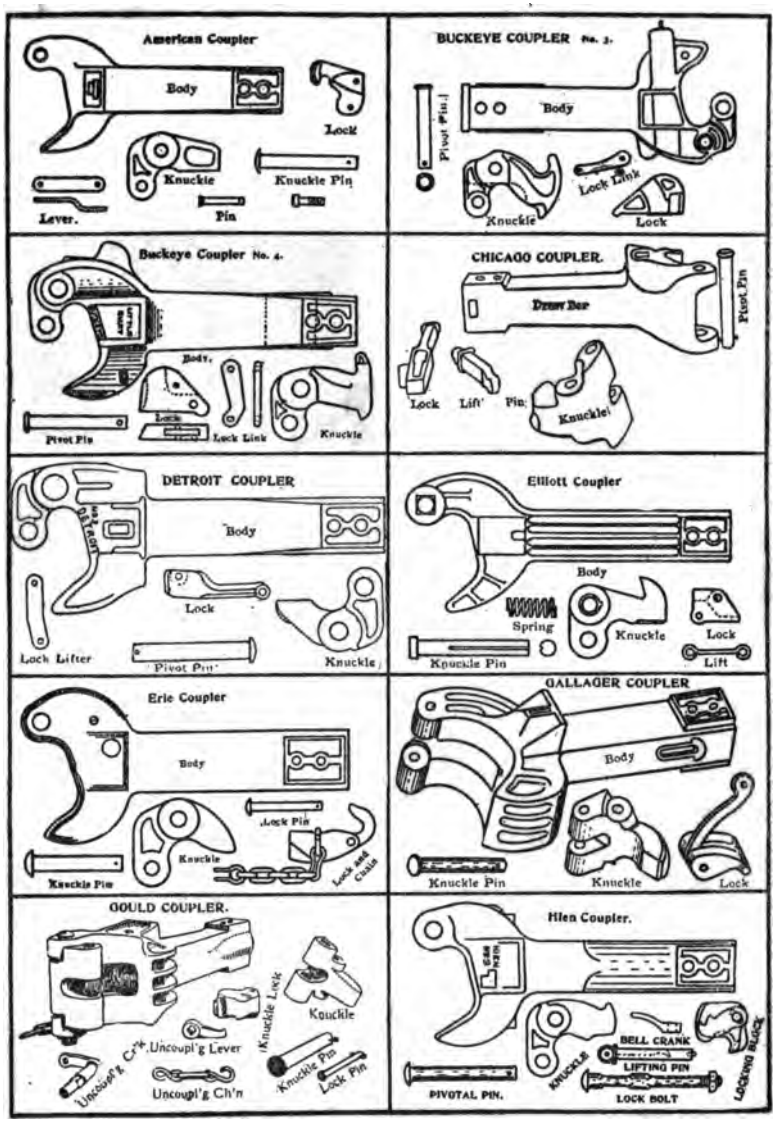


PLATE No. 64.

COUPLER CHART.

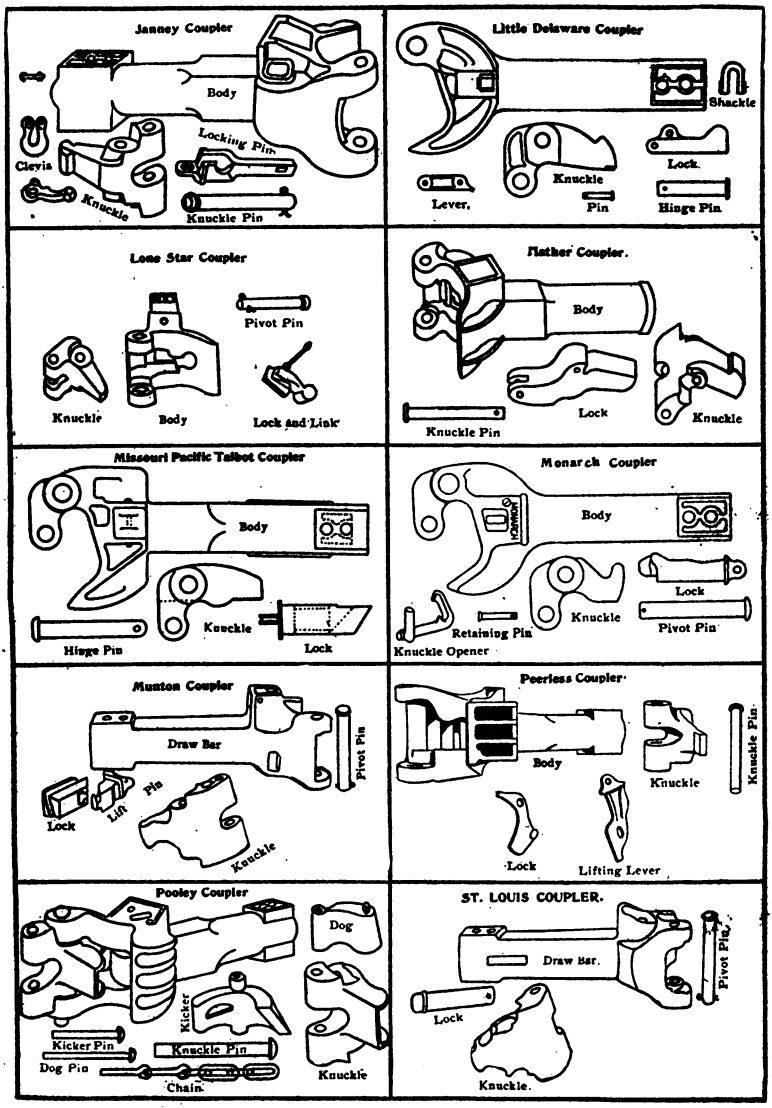


PLATE No. 64A.

COUPLER CHART.

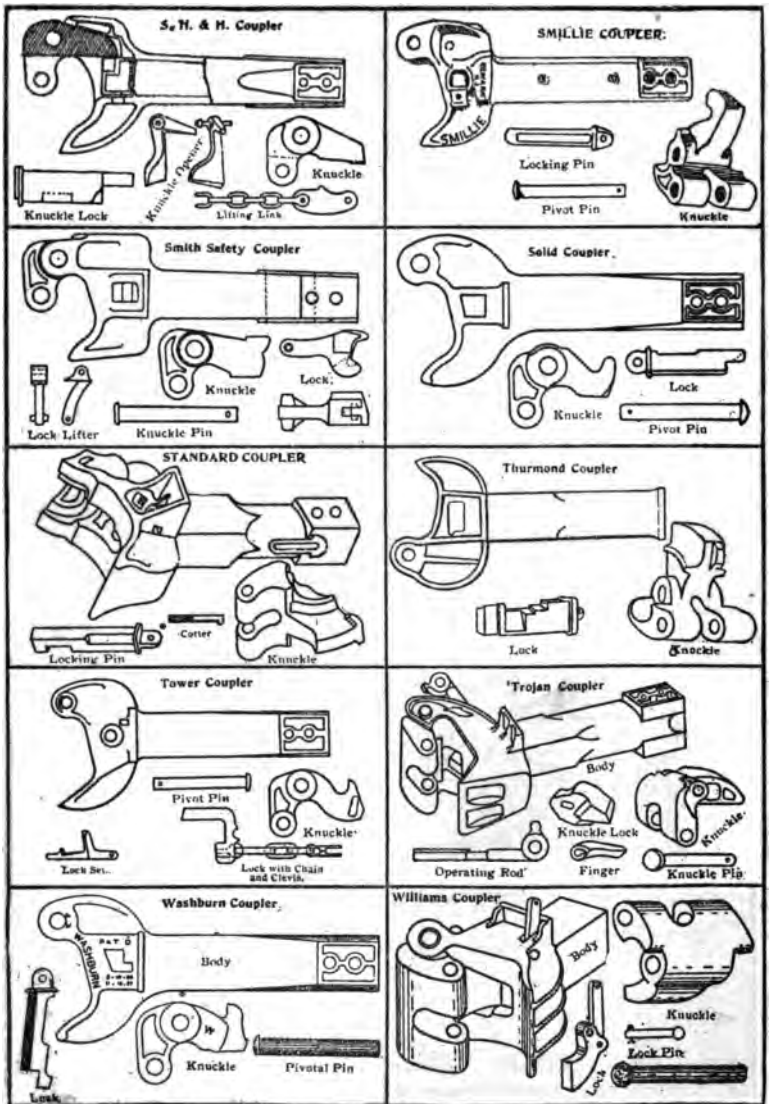


PLATE No. 64B.

fairly well taken care of, but it is the heavy and sudden shocks that cars receive while being switched, and by being brought to an emergency stop while in trains, that tends to shorten their service.

In the following Plates are shown some of the main Draft Gears and Automatic Couplers, and parts, which are extensively used in Modern Freight Car construction.

COUPLER CHART.

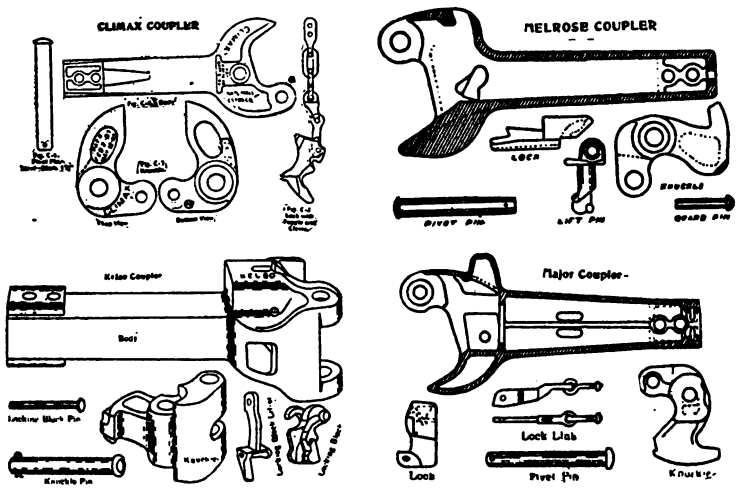


PLATE No. 64C.

UNCOUPLER ARRANGEMENTS FOR M. C. B. COUPLERS.

In 1897 designs showing the details of uncoupling arrangements to concealed end sill cars and outside end sill cars were adopted as Recommended Practice.

M. C. B. RECOMMENDED PRACTICE FOR UNCOUPLING ATTACHMENTS

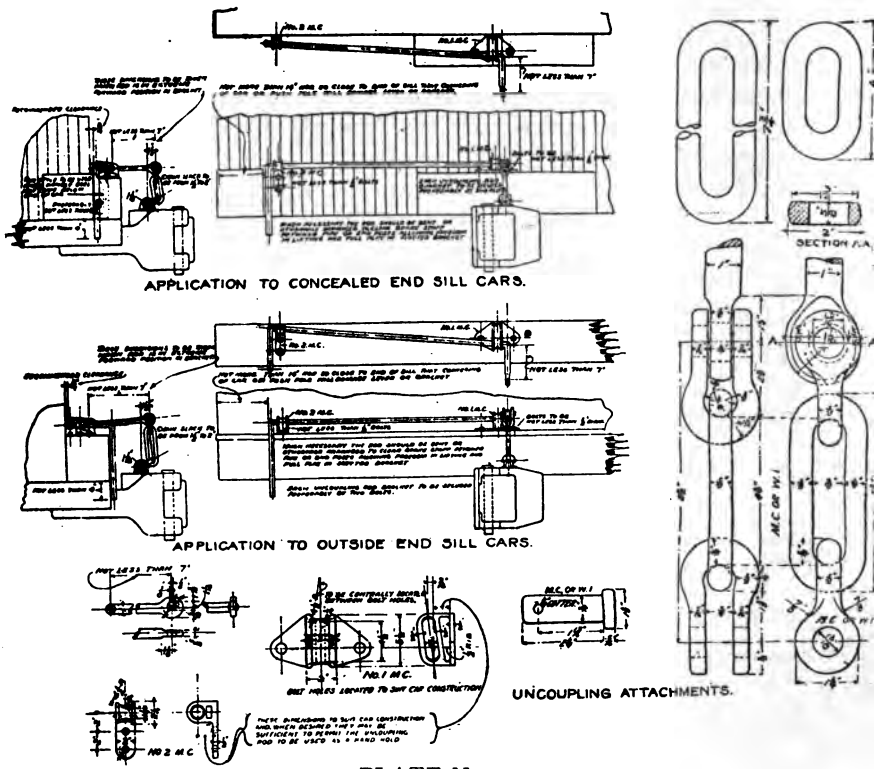


PLATE No. 65.

In 1905 the shoulder of the bracket for the uncoupling rod was made bevel.

In 1908 these details were revised and changes made to overcome former defects.

The special feature of this uncoupling attachment is the slotted center bracket. By placing the rod back on top of end

sill or head block a longer arm is obtained, which gives sufficient lift with ample slack in the chain, and by using a sloping slotted bracket the rod projects 1½ inches in front of coupler lock, which is about the best position for an efficient lift.. The slotted bracket allows the rod to slide back 3½ inches and avoids interference when slack of train is bunched.

The handle shown should preferably project below end of car or be bent as shown by dotted lines on Plate 65, in order to protect the operator's hand.

Three links 3¾ inches, 5¾ inches and 7¾ inches long, respectively, are shown. By using one of these three links, therefor, a chain of 6½, 8½ or 10½ inches long is obtained, which should fit all cars and M. C. B. couplers. These links should avoid the use of split links, "S" hooks and other temporary repair devices now very common. The arrangement as a whole is applicable to all types of cars, and if properly applied will largely obviate present troubles. Only a few limiting dimensions are shown on the drawing, as the others must be adapted to each particular class of car; but the dimensions for center arm, chain slack and position of lift pin eye should be carefully adhered to. See Plate 65.

CHAPTER VI.

FREIGHT CAR TRUCKS.

Wheels, Axles, Arch Bars, Tie Bars, Journal Boxes, Bolsters, Etc.

A freight car truck as defined by the M. C. B. Association is mechanically a small four-wheel (or sometimes six-wheel) car, under each end of car body, and carrying the latter as a dead load by means of two swiveling center plates connected by a center pin or king bolt. The purpose of the truck is to enable short wheel bases to be used in connection with long car bodies. For general construction see Plate 70.

WHEELS, of which there are four, are used in the construction of each freight car truck. However there are a few trucks equipped with six wheels, these being designed for special lading, and are not found under the common freight car. Wheels are usually 33″ in diameter, cast iron with chilled tread. The specifications as given by the M. C. B. Association are closely followed by all manufacturers, as all M. C. B. wheels are interchangeable.

STANDARD FREIGHT CAR TRUCK.

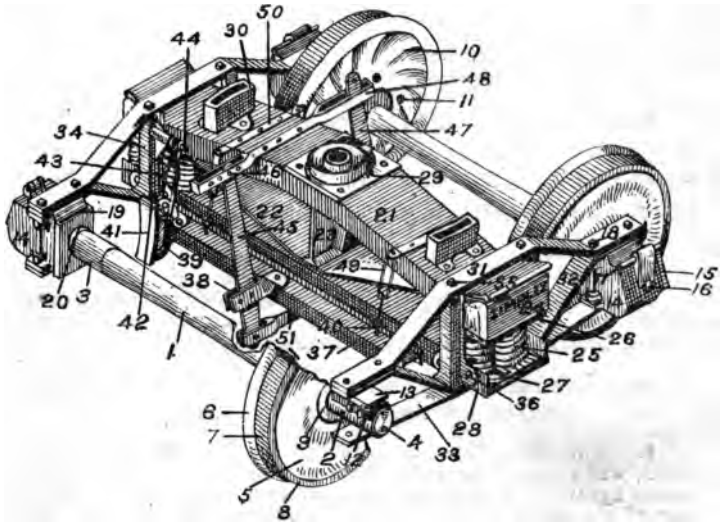


PLATE No. 70.

List of Parts.

1. Axle.
2. Journal.
3. Wheel Seat.
4. Journal Collar.
5. Wheel.
6. Wheel Flange.
7. Wheel Tread.
8. Wheel Rim.
9. Wheel Hub.
10. Wheel Brackets.
11. Wheel Core Hole.
12. Journal Bearing.
13. Journal Bearing Wedge.
14. Journal Box.
15. Journal Box Lid.
16. Journal Box Spring.
17. Journal Box Hinge Pin.
18. Journal Box Bolt.
19. Dust Guard.
20. Dust Guard Bearing.
21. Truck Bolster.
22. Truck Bolster Truss Plate.
23. Truck Bolster Strut.
24. Truck Bolster End Cap Casting.
25. Truck Spring.
26. Truck Spring Cap or Block.
27. Truck Spring Seat.
28. Spring Plank.
29. Truck Center Plate.
30. Truck Side Bearing.
31. Top Arch Bar.
32. Bottom Arch Bar.
33. Tie Bar.
34. Truck Column.
35. Truck Column Bolt.
36. Truck Column Guide Bolt.
37. Brake Beam.
38. Brake Beam Fulcrum.
39. Brake Beam Head.
40. Brake Beam Hook Bolt.
41. Brake Shoe.
42. Brake Shoe Key.
43. Brake Hanger.
44. Brake Hanger Pin.
45. Dead Lever.
46. Dead Lever Guide.
47. Brake Lever.
48. Brake Lever Guide.
49. Safety Chain.
50. Safety Chain Guide.
51. Brake Lever Coupling Bar, or Bottom Rod.

Following are the requirements of M. C. B. Association for 33" cast iron wheels having a minimum weight of 615, 665 and 715 lbs., for cars of 60,000, 80,000 and 100,000 lbs. capacity:

CAST-IRON WHEELS.

In 1904 designs of wheels for cars of 60,000 pounds, 80,000 pounds and 100,000 pounds capacity were adopted as Recommended Practice. Revised 1907. Modified 1909.

SPECIFICATIONS FOR 33-INCH CAST-IRON WHEELS FOR CARS OF 60,000, 80,000 AND 100,000 POUNDS CAPACITY.

1. Chills must have an inside profile that, in the finished wheel, will produce the exact form of flange and tread contour shown by M. C. B. drawings adopted 1909. The normal diameter of the wheel produced by the chill must be the M. C. B. Standard of 33 inches, measured at a point 2⅝ inches from outside of tread of wheel.

2. Wheels furnished under this specification must not very more than one-fourth (¼) of an inch above or below the normal size "measured on the circumference," and the same wheel must not vary more than one-sixteenth (1-16) of an inch in diameter. The body of the wheel must be smooth and free from slag, shrinkage or blowholes. The tread must be free from deep and irregular wrinkles, slag, chill cracks and sweat or beads in throat, and swelled rims.

3. The wheels must show clean gray iron in the plates, except at chaplets, where mottling to not more than one-half (½) inch from same will be permitted. The depth of pure white iron must not exceed one (1) inch nor be less than one-half (½) inch in the middle of the tread.

(A) It shall not exceed one (1) inch in the middle of the tread nor be less than three-eighths (⅜) inch in the throat for wheels having a maximum weight of six hundred and twenty-five (625) pounds.

(B) It shall not exceed one (1) inch in the middle of the tread nor be less than seven-sixteenth (7-16) inch in the throat for wheels having a maximum weight of six hundred and seventy-five (675) pounds.

(C) It shall not exceed one (1) inch in the tread nor be less than one-half (½) inch in the throat for wheels having a maximum weight of seven hundred and twenty-five (725) pounds.

CAST IRON WHEEL FOR 60,000 LBS. CARS

Max. Wt. 625 lbs., Min. Wt. 615 lbs.

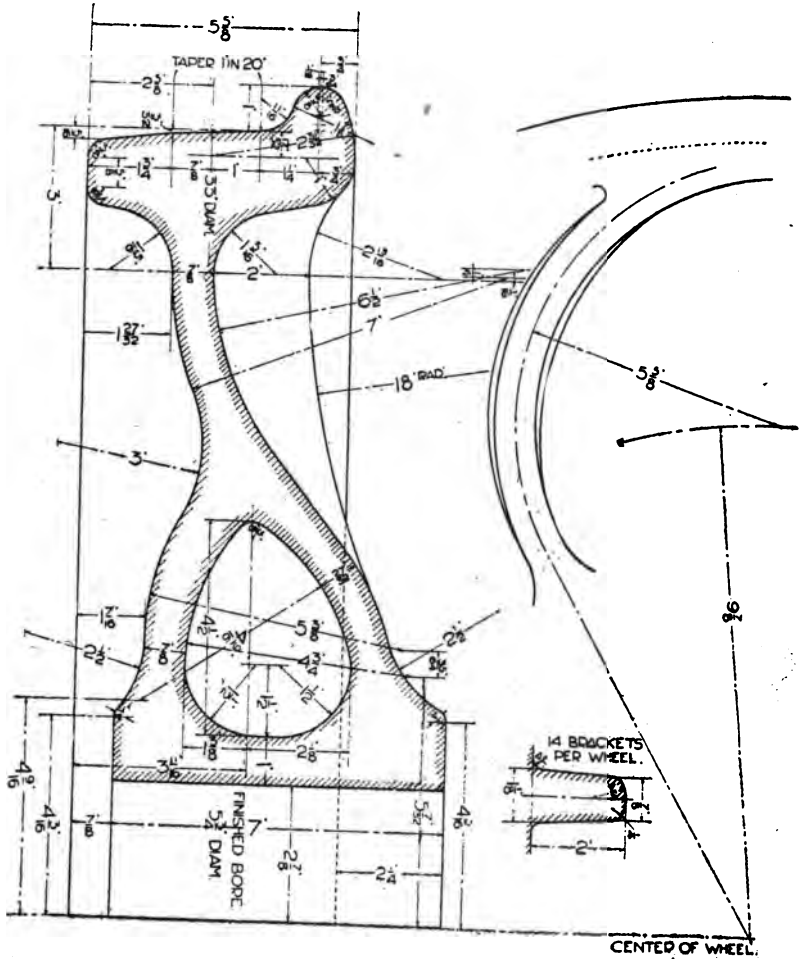


PLATE No. 71.

CAST IRON WHEEL FOR 80,000 LBS. CARS

Max. Wt. 675 lbs. Min. Wt. 665 lbs.

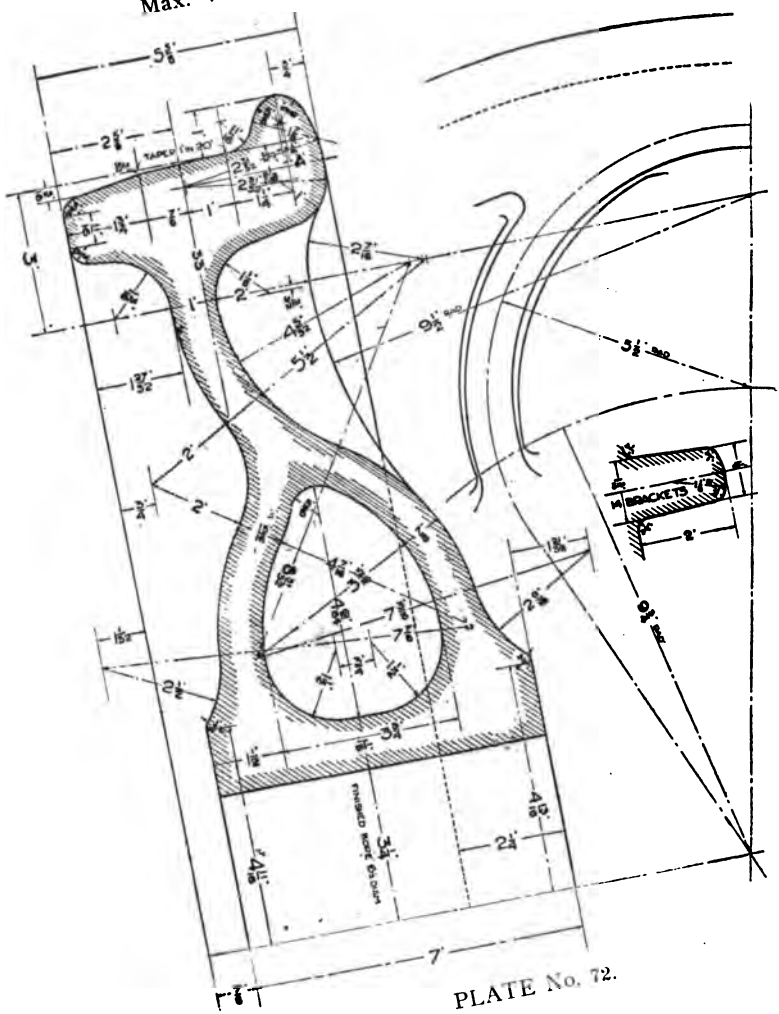


PLATE No. 72.

CAST IRON WHEEL FOR 100,000 LBS. CARS

Max. Wt. 725 lbs. Min. Wt. 715 lbs.

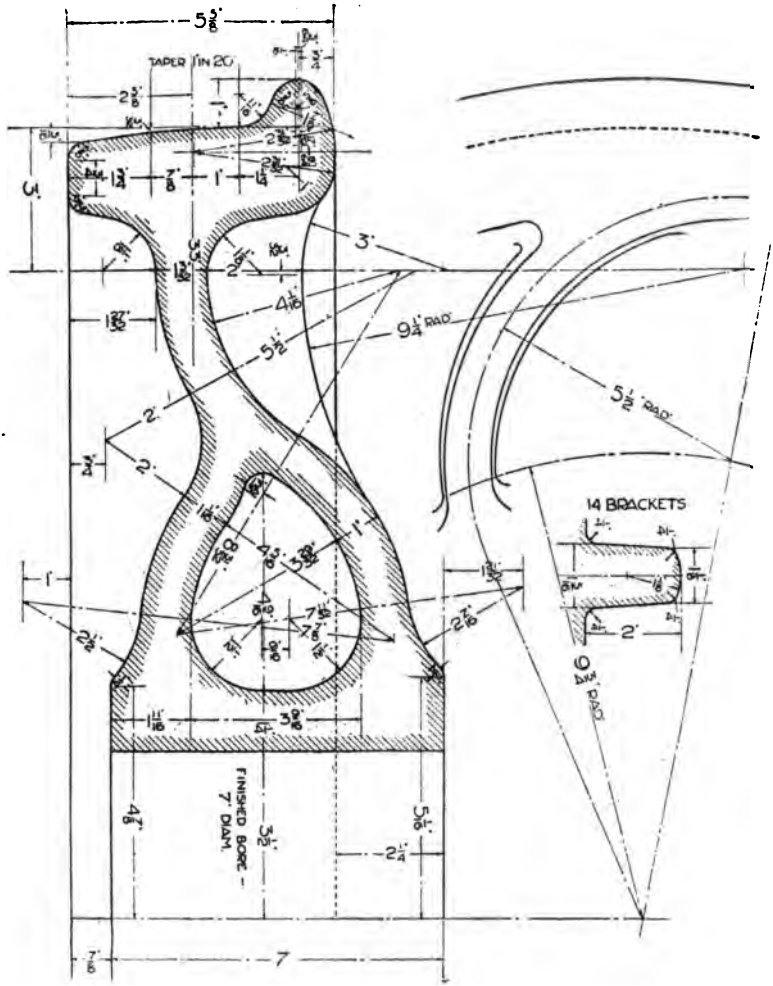


PLATE No. 73.

(D) The depth of white iron shall not vary more than one-fourth (¼) of an inch around the tread on the rail line in the same wheel.

4. When ready for inspection, the wheels must be arranged in groups, all wheels of the same date being grouped together, and for each hundred wheels which pass inspection and are ready for shipment, two representative wheels shall be taken at random, one of which shall be subjected to the following tests:

The wheels shall be placed flange downward on an anvil block, weighing not less than seventeen hundred (1,700) pounds, set on rubble masonry at least two (2) feet deep, and having three supports not more than five (5) inches wide to rest upon. It shall be struck centrally on the hub, by a weight of two hundred (200) pounds.

(A) For wheels having a maximum weight of six hundred and twenty-five (625) pounds, ten (10) blows falling from a height of nine (9) feet.

(B) For wheels having a maximum weight of six hundred and seventy-five (675) pounds, twelve (12) blows falling from a height of ten (10) feet.

(C) For wheels having a maximum weight of seven hundred and twenty-five (725) pounds, twelve (12) blows falling from a height of twelve (12) feet.

Should the test wheel stand the given number of blows without breaking in two or more pieces, the inspector will then subject the other wheel to the following test:

The wheel must be laid flange down in the sand, and a channel way one and one-half (1½) inches wide and four (4) inches deep must be molded with green sand around the wheel. The clean tread of the wheel must form one side of the channel way, and the clean flange must form as much of the bottom as its width will cover. The channel way must then be filled to the top with molten cast iron, which must be hot enough when poured, so that the ring which is formed, when metal is cold, shall be solid or free from wrinkles or layers. The time when the pouring ceases must be noted, and two minutes later an examination of the wheel must be made. If the wheel is found broken in pieces, or if any crack in the plate extends through or into the tread, the one hundred wheels represented by the tests will be rejected.

5. In the drop tests, should the test wheel break in two or more pieces with less than the required number of blows, then the second wheel shall be taken from the same lot and similarly tested. If the second wheel stands the test it shall be optional with the inspector whether he shall test the third wheel or not; if he does not do so, or if he does, and the third wheel stands

the test, the hundred wheels shall be accepted as filling the requirements of the drop test.

6. The lower face of the weight of two hundred (200) pounds shall be eight (8) inches diameter, and have a flat face.

7. The thickness of the flange shall be regulated by the maximum and minimum flange thickness gauges adopted by the M. C. B. Association in 1907.

All wheels furnished under this specification must conform to the respective sections shown by M. C. B. drawings for the different weights of wheels, and these weights shall be as follows:

(A) Wheels for service under 60,000-pound capacity cars shall have a maximum weight not exceeding six hundred and twenty-five (625) pounds, and a mimimum weight not less than six hundred and fifteen (615) pounds.

(B) Wheels for service under 80,000-pound capacity cars shall have a maximum weight not exceeding six hundred and seventy-five (675) pounds, and a minimum weight not less than six hundred and sixty-five (665) pounds.

(C) Wheels for service under 100,000-pound capacity cars shall have a maximum weight not exceeding seven hundred and twenty-five (725) pounds, and a minimum weight not less than seven hundred and fifteen (715) pounds.

(D) Weights given for the respective wheels mentioned in sections A, B and C are based on M. C. B. Standard drawings covering wheel design adopted in 1909.

8. All wheels must be numbered consecutively in accordance with instructions from the railroad company purchasing them and must have the initials of such railroad company, also the wheel number, the weight of wheel, and the day, month and year when made plainly formed on the inside plate in casting. No two wheels shall have the same number. All wheels shall also have the name of the maker and place of manufacture plainly formed on the outside plate in casting.

Wheels conforming to the requirements and furnished under this specification must have the letters "M. C. B., 1909" plainly formed on the outside plate in casting.

9. Individual wheels will not be accepted which

(1) Do not conform to standard design and measurements.

(2) Are under minimum weight. *All excess weight over the maximum given to be at the expense of the manufacturer.*

(3) Have physical defects described in Section 2.

Any lot of one hundred wheels submitted to test will not be accepted

(1) If wheels broken do not meet the prescribed drop test.

(2) If the wheel tested does not stand the thermal tests.

(3) If the conditions prescribed in Section 3 are not complied with.

10. All wheels must be taped with M. C. B. Standard design of wheel circumference tape having numbers 1, 2, 3, 4, 5 stamped one-eighth (⅛) inch apart, the figure three (3) to represent the normal diameter, 103.67 inches circumference. The figure one (1) the smallest diameter and the figure five (5) the largest diameter.

MOUNTING WHEELS.

In 1897 the Recommended Practice for mounting wheels was modified by letter ballot by the omission of that part providing, among other things, that wheels with flanges worn to a thickness of 1⅛ inches or less should not be remounted, and the substitution therefor of the following:

First.—That wheels with flanges worn to a thickness of 1 1-16 inches or less shall not be remounted.

Second.—That the thickness of flanges of wheels fitted on the same axle should be equal and should never vary more than 1-16 inch.

Third.—That in mounting wheels, new or secondhand, the standard wheel check gauge should be used in the following manner:

After one wheel is pressed into position, place the stop "A" or "B" of the check gauge against the inside of the flange of the wheel with the thinner flange with the corresponding tread stop "C" or "D" against the tread of the wheel. Press the other wheel on the axle until the opposite tread stop comes in contact with the tread with the corresponding gauge point "E" or "F" in contact with the outside of the thicker flange.

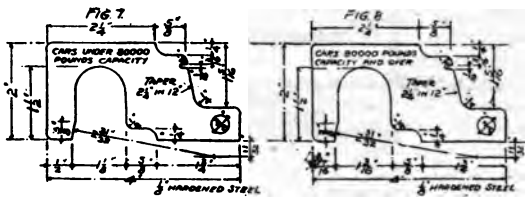
LIMIT GAUGES FOR INSPECTING SECONDHAND WHEELS FOR REMOUNTING.

In 1907 limit gauges for use at shops when inspecting secondhand wheels for remounting were adopted as Recommended Practice. They are shown in Plate 74. Modified, 1909.

MINIMUM THICKNESS FOR STEEL TIRES.

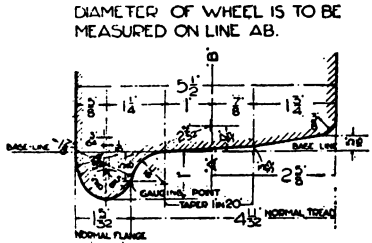
In 1894 a Recommended Practice was adopted for Minimum Thickness for Steel Tires of Car Wheels, to be 1 inch, to be measured normal to the tread and radial to the curved portions of the flange through the thinnest part within 4¼ inches from the back of the flange; the thickness from the latter point to the outer edge of tread to be not less than ½ inch at thinnest part as shown in Plate 76.

PLATE No. 74.



LIMIT GAUGE,
FOR REMOUNTING CAST. IRON WHEELS.

PLATE No. 75.



WHEEL TREAD AND FLANGE FOR STEEL AND STEEL-TIRED WHEELS.

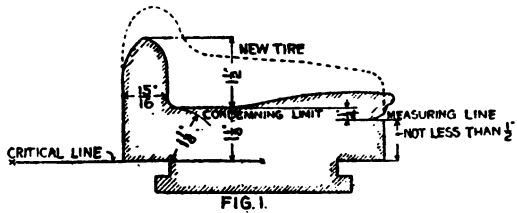


FIG. 1.
STEEL TIRE.
RETAINING RING FASTENING.

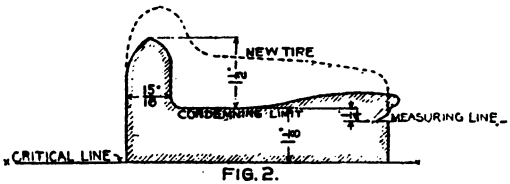


FIG. 2.
STEEL TIRE.
SHRINKAGE FASTENING ONLY.

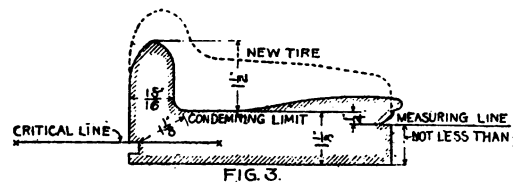


FIG. 3.
STEEL TIRE.
RETAINING RING FASTENING.

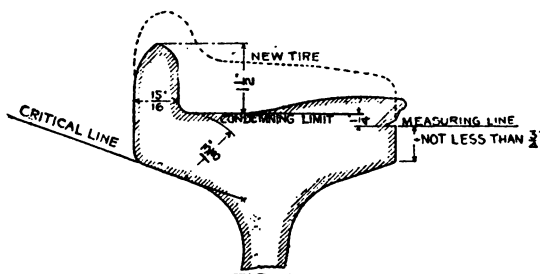
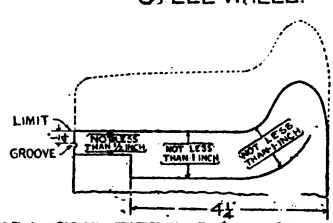


FIG. 4.
STEEL WHEEL.



WORN STEEL TIRE AND FLANGE LIMITS.

PLATE No. 76.

A further practice was adopted of cutting a small groove, as shown in the outer face of all tires when wheels are new, at a radius ¼ inch less than that of the tread of tire when worn to the prescribed limit, to facilitate inspection.

WHEEL TREAD AND FLANGE FOR STEEL AND STEEL-TIRED WHEELS.

In 1909 the former illustration then shown was discarded, and the four illustrations shown in Plate 75 substituted, to govern service operations for both steel and steel-tired wheels under both passenger and freight cars.

Also, that the location of limit of wear of groove be ¼ inch below the tread face on steel and steel-tired wheels where same have worn to condemning limit, as shown in illustrations in Plate 75; the shape of the groove to be as shown on these illustrations and the measurements to be taken from the horizontal or inside edge of same.

In 1909 the tread and flange contour for steel and steel-tired wheels was revised as shown in Plate 75. It is exactly similar to the new tread and flange contour for cast-iron wheels from the point of the flange to the outside of the tread only, and the development of the flange from the point to the back face of the wheel or tire has been made of such form that the same mounting and inspecting gauge used for cast-iron wheels can be used for the new section of steel and steel-tired wheels.

AXLES—(Plate 70, Fig. 1.) Axles are made of iron and steel. The axles which are usually found under common freight cars of today are iron. The wheels are fitted to axle by hydraulic pressure, varying from 40,000 to 60,000 pounds. After the wheels have been fitted, there is a portion of the axle extending outside of each wheel. This is called the journal, (See Plate 70, Fig. 2), on which the juornal bearings or brasses rest which are composed of anti-friction metal, with usually a thin coat of lead to make it self-fitting, under which babbitt metal in some of its various forms is used. In order that the journal bearing may be more easily removed, and the load more equally distributed, a metal wedge or key

is placed on the top of the journal bearing. (See Plate 70, Fig. 13).

The M. C. B. Association have recommended a standard axle, of both iron and steel, and, like the wheels, these standards are closely followed. On the following pages will be found the M. C. B. Recommended Practice treating iron and steel axles separately:

The size of axles are usually of the following measurements:

Journal	Wheel Seat	Center
3-¾"	5-⅛"	4-¼"
4-¼"	5-¾"	4-¾"
5"	6½"	5-⅜"
5-½"	7"	5-⅞"

AXLES.

In 1899 it was decided that the standard axles should be known by letters.

In 1901 a designation was given the standard axles, whereby each shall be known to carry a definite weight instead of for cars of particular capacity.

AXLE.—A.

With Journals, 3¾ by 7 inches. Plate No. 78.

Designed to carry 15,000 pounds.

This axle is the standard of the Association for cars of 40,000 pounds capacity.

In 1873 a standard for car axle was recommended, the form and dimensions of which, excepting the diameter in the middle, were substantially the same as shown in this sheet. In 1884 the diameter at the middle was increased from 3⅞ inches to 4¼ inches, by letter ballot.

In 1901 the diameter of wheel seat was changed from 4⅞ to 5⅛ inches.

In 1901 a notation was added to the drawing of this axle showing a straight taper between certain points on the axle; also a diagram showing location of the borings to be taken from steel axles for analysis.

In 1902 further changes were made in the diameter of the tapered portion where it joins the fillet next to the rough collar; also in the diameter of the rough collar.

For action of the Association see Proceedings 1876, page 99; Proceedings 1878, page 129; Proceedings 1879, page 103; Proceedings 1880, page 130; Proceedings 1884, pages 156-162.

In 1907 the radius between the wheel seat and the rough collar on the inside of the hub of the wheel was changed to ¾ inch, with the center from which the radius is struck coincident with the inside face of the hub of the wheel.

The radius between the dust guard and wheel seat was changed to ¼ inch.

AXLE.—B.

With Journals, 4¼ by 8 inches. Plate No. 78.

Designed to carry 22,000 pounds.

This axle was adopted as a standard of the Association for cars of 60,000 pounds capacity, by letter ballot, in 1889; see Proceedings 1889, pages 88-109.

In 1901 the diameter of wheel seat was changed from 5⅝ inches to 5¾ inches.

In 1901 a notation was added to the drawing of this axle, showing a straight taper between certain points on the axle; also a diagram showing location of borings to be taken from steel axles for analysis.

In 1901 the diameter of the middle was increased from 4⅝ inches to 4¾ inches.

In 1902 changes were made in the diameter of the tapered portion of the axle where it joins the fillet next to collar.

In 1907 the radius between the wheel seat and the rough collar on the inside of the hub of the wheel was changed to ¾ inch, with the center from which the radius is struck coincident with the inside face of the hub of the wheel.

The radius between the dust guard and wheel seat was changed to ¼ inch.

AXLE.—C.

With Journals, 5 by 9 inches. Plate No. 78.
Designed to carry 31,000 pounds.

This axle was adopted as recommended practice in 1896, and was made a standard of the Association in 1898.

In 1901 the diameter of wheel seat was changed from 6⅜ inches to 6½ inches.

In 1901 a notation was added to the drawing of this axle showing a straight taper between certain points on the axle; also a diagram showing the location of borings to be taken from steel axles for analysis.

In 1902 changes were made in the diameter of the tapered portion of the axle where it joins the fillet next to collar, also in the diameter of the rough collar.

In 1907 the radius between the wheel seat and the rough collar on the inside of the hub of the wheel was changed to ¾ inch, with the center from which the radius is struck coincident with the inside face of the hub of the wheel.

The radius between the dust guard and wheel seat was changed to ¼ inch.

AXLE.—D.

With Journals, 5½ by 10 inches. Plate No. 78.
Designed to carry 38,000 pounds.

This axle was adopted as a standard of the Association in 1899.

In 1901 the diameter of wheel seat was changed from 6⅞ inches to 7 inches.

In 1901 a notation was added to the drawing of this axle showing a straight taper between certain points on the axle; also a diagram showing the location of borings to be taken from steel axles for analysis.

In 1902 changes were made in the diameter of the tapered portion of the axle where it joins the fillet next to collar; also in the diameter of the rough collar.

In 1906 a ¾-inch radius was adopted between the wheel fit and the rough collar adjoining the inside hub of the wheel; also the radius between the dust guard and wheel fit was increased to ¼ inch.

In 1907 the center from which the radius of ¾ inch is struck was made coincident with the inside face of the hub of the wheel.

DUST-GUARDS.

In 1909 standard dimensions for dust guards were adopted for the four standard journal boxes. See Plate No. 78.

SPECIFICATIONS FOR IRON AXLES.

In 1899 the following specifications, including tests for iron axles, were adopted as Recommended Practice:

Car axles for the use of this company will be ordered subject to the following conditions:

1. All axles must conform in shape and size to the dimensions shown on the blue-prints, which will be furnished by the.....R. R. Co.

2. All axles must be cut off and faced to exact lengths, and be centered with 60 degree centers in the manner indicated in blue-prints, so as to prevent lathe centers from bottoming. Axles must be made of double-work fagoted scrap, 16 per cent of new bar iron worked into the center of the axles being allowed if desired. Axles must be well hammered and free from any clearly defined open seams. They must finish in the lathe with journal free from flaws in the shape of holes, pieces shelled out, or open seams large enough, so that with a knife blade scale or dirt can be removed from such seams, or open seams showing a clear opening of 1-32 inch or over, and being more than 1 inch long. The maker's name or initials must be stamped plainly on each axle.

3. All axles are to be inspected and tested at the works where they are made. The .....shall be notified when they are ready for inspection. Under no circumstances shall car axles be shipped from the works where they are made until they have been tested, inspected and accepted by a proper representative of the company.

4. For each one hundred axles or fraction thereof ordered, one additional axle must be furnished for test. This axle will be selected at random from the pile, and subjected to the prescribed drop test for iron axles of its class. If it stands the test the one hundred axles, or fractional part thereof that it represents, will be inspected, and only those accepted that are made in a workmanlike manner and are free from defects mentioned in these specifications. All axles received are subject to rejection if they do not finish in the lathe in accordance with the requirements herein given. The manufacturer must furnish, free of charge, the axles that are to be tested, the testing appara-

tus, and the assistance necessary to enable the inspector to make a satisfactory inspection and test. Axles will not be accepted if the diameters fall below the dimensions for forged sizes given in the blue-prints, or if exceeding those dimensions by more than ⅛ inch. Car axles in the rough must not have less than the prescribed minimum weight, nor more than the prescribed maximum weight for axles of their class.

AXLE DROP TEST.

5. All axles will be tested physically by drop test. The testing machine must conform in its essential parts to the drawings adopted by the Master Car Builders' Association. These essential parts are: The points of supports on which the axle rests during tests must be three (3) feet apart from center to center; the tup must weigh 1,640 pounds; the anvil, which is supported on springs, must weigh 17,500 pounds; it must be free to move in a vertical direction; the springs upon which it rests must be twelve in number, of the kind described on drawing, and the radius of the supports and of the striking face on the tup in the direction of the axis of the axle must be five (5) inches. When an axle is tested it must be so placed in the machine that the tup will strike it midway between the ends, and it must be turned over after the first and third blows, and when required afer the fifth blow. After the first blow the deflection of the axle under test will be measured in the manner specified below.

6. It is desired that the axles when tested as specified above shall stand the number of blows at the heights specified in the following table without rupture, and without exceeding, as the result of the first blow, the deflections given:

AXLE.	NO. BLOWS.	HEIGHT OF DROP.	DEFLECTION.
M. C. B. 4¼ by 8 inch journals..	5	21½ ft.	7⅛ in.
M. C. B. 5 by 9 inch journals....	5	29 ft.	6 1/16 in.
M. C. B. 5½ by 10 inch journals.	5	36 ft.	5 7/16 in.

7. Axles will be considered as having failed on drop test and will be rejected if they rupture or fracture in any way, or if the deflection resulting from the first blow exceeds the following:

M. C. B. axle, 4¼ by 8 inch journals.. 8 1-8 inches.
M. C. B. axle, 5 by 9 inch journals.... 8 1-16 inches.
M. C. B. axle, 5½ by 10 inch journals. 6 1-16 inches.

In order to measure the deflection, prepare a straight-edge as long as the axle by reinforcing it on one side, equally at each end, so that when it is laid on the axles the reinforced parts will rest on the collars of the axle, and the balance of the straight-edge not touch the axle at any place. Next place the axle in position for test, lay the straight-edge on it, and measure the distance from the straight-edge to the axle at the middle point of the latter. Then, after the first blow, place the straight-edge on the now bent axle in the same manner as before, and measure the distance from it to that side of the axle next to the straight-edge at the point farthest away from the latter. The difference of the two measurements is the deflection.

SPECIFICATIONS FOR STEEL AXLES.

In 1899 the following specifications, including tests for steel axles, were adopted as Recommended Practice:

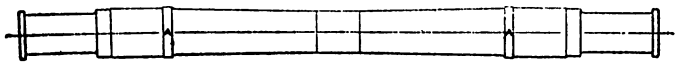
1. Axles will be ordered not less than 100 on one order. All axles must be made and finished in a workmanlike manner, and must be free from cracks, or seams, or flaws which can be detected by the eye. All parts must be rough turned, except at point "A" on diagram below.

2. All axles must be made of steel, and the material desired have the following composition:

Carbon	0.40 per cent.
Manganese, not above	0.50 per cent.
Silicon	0.05 per cent.
Phosphorus, not above	0.05 per cent.
Sulphur, not above	0.04 per cent.

3. All axles must conform in sizes, shapes and limiting weights to the requirements given on the order or print sent with it. The rough turning must be done with a tool so shaped as to leave the surface free from ridges; and in centering them 60-degree centers must be used with proper clearance for lathe centers. All axles must be legibly stamped when offered for test, on the unfinished portion, "A" on diagram below, with the blow or heat number and the date, and on the cylindrical portion at center they must be stamped with the name of the maker.

Portions marked "A" to be unfinished and to have stamped upon either of them blow number and date.



4. Manufacturers must notify..... when they are ready to ship not less than 100 axles; must have all the axles made from each heat, and no others, in a pile by themselves; must furnish the testing machine referred to in Section 6, and the proper appliances for checking the dimensions and weights; must have a car or cars ready to receive shipment; must furnish the labor and power necessary to enable the inspector to promptly inspect and test; and ship or store the axles when tests are finished. Axles which, when offered for test, are so rusty as to hide defects will not be considered.

5. A shipment of axles being ready for test, the inspector will first make a list of the heat numbers in the various piles of axles offered, and the number of axles bearing the same heat number in each pile. If he finds in any pile axles bearing different heat numbers he must, before going further, have the pile rearranged, so that only those axles having the same heat number will be in the same pile. Also, if he finds in any pile any axles having evidences of changed or defaced heat numbers, or any axles having heat numbers not clearly legible, or any bearing heat numbers previously rejected, he will exclude such axles from further consideration. He will then examine the axles in each pile or heat, as to workmanship and defects visible to the eye, and as to whether they conform to dimensions and directions on the order, or tracing, or in these specifications. All axles not satisfactory in these respects must be laid aside and will not be further considered. This being done, if less than thirty axles in any heat are left, he will refuse to consider that heat further. If in this inspection defects are found which the manufacturer can remedy while the inspector is at the works, he may allow such defects to be cured and may count the axles which are successfully treated in this way as a part of the thirty above mentioned. Not less than thirty axles from any one heat having passed the foregoing inspection, the inspector will select from each pile or heat, one axle at random, and subject it to the physical test prescribed for such axles as may be under consideration. If the test axle fails to fill the physical requirements, all the axles from that heat of steel will be regarded as

rejected, and none of them will at any time be considered again. If the test axle passes physical test, the inspector will draw a straight line parallel with the axis of this test axle ten (10) inches long, starting from one end of it, and prick-punch this line at several points. He will then have a piece about six (6) inches long cut off from the same axle, so as to leave some of the prick-punch marks on each piece of the axle. The 6-inch piece must be sent at once, properly tagged, to.....
The piles of axles which have passed physical test will be allowed to remain as the inspector leaves them, until the results of the chemical test are known. The 6-inch piece being received at the laboratory, a line will be drawn from the prick-punch line above described, through the center of the axle across the cut-off end, and a prick-punch mark made on this last line, 40 per cent of the distance from the center to the circumference of the axle. Borings for analysis will be taken by means of a ⅝-inch diameter drill, acting parallel to the axis of the axle, and starting with its center in the last described prick-punch mark. The borings will be analyzed in accordance with standard methods, and the results of analysis will be communicated to the inspector, who will at once proceed to the works, and reject, or accept and ship, or mark and store, as the case may be, the axles in question. If the analysis of any test axle shows that the steel does not meet the chemical requirements, all of the axles of that heat will be regarded as rejected, and none of them will at any time be considered again. If the analysis of any test axle shows that the steel meets the chemical requirements, all of the axles of that heat which have passed inspection and physical test will be regarded as accpted. The inspector will proceed to load and ship from the accepted axles as many as may be required to fill the order. If, as the result of inspection and the physical and chemical tests, more axles are accepted than the order calls for, such accepted axles in excess will be stamped by the inspector with his own name, and will then be piled and allowed to remain at the works, subject to further orders from the purchasing agent. On receipt of further orders, axles once accepted will, of course, not be subjected to further test, but in no case will even accepted axles be loaded and shipped except in the presence of the inspector. In all cases the inspector will keep an accurate record of the heat numbers, of the number of axles in each heat which are rejected, or stored, and will transmit this information with each report.

6. All axles will be tested physically by drop test. The testing machine must conform in its essential parts to the drawings adopted by the Master Car Builders' Association. These essential parts are: The points of supports on which the axle

rests during tests, must be three feet apart from center to center; the tup must weigh 1,640 pounds; the anvil, which is supported on springs, must weigh 17,500 pounds; it must be free to move in a vertical direction; the springs upon which it rests must be twelve in number, of the kind described on drawing; and the radius of supports and of the striking face on the tup in the direction of the axis of the axle must be five (5) inches. When an axle is tested it must be so placed in the machine that the tup will strike it midway between the ends, and it must be turned over after the first and third blows, and when required, after the fifth blow. After the first blow, the deflection of the axle under test will be measured in the manner specified below.

7. It is desired that the axles, when tested under the drop test as specified above, shall stand the number of blows at the height specified in the following table without rupture and without exceeding as the result of the first blow the deflections given:

AXLE.	NO. BLOWS.	HEIGHT OF DROP.	DEFLECTION.
M. C. B. 4¼ by 8 inch journals for 60,000-pound cars.....	5	34 ft.	7 in.
M. C. B. 5 by 9 inch journals for 80,000-pound cars.....	5	43 ft.	5¾ in.
M. C. B. 5½ by 10 inch journals for 100,000-pound cars.....	7	43 ft.	4 in.

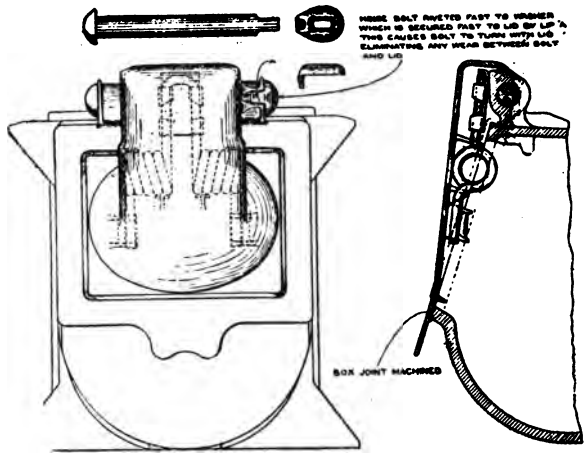
8. Axles will be considered as having failed on physical test and will be rejected if they rupture or fracture in any way, or if the deflection resulting from the first blow exceeds the following:

M. C. B. axle, 4¼ by 8 inch journals..... 7½ inches.
M. C. B. axle, 5 x 9 inch journals..... 6¼ inches.
M. C. B. axle, 5½ by 10 inch journals... 4½ inches.

9. Axles will be considered to have failed on chemical test and will be rejected if the analysis of the borings taken as above described gives figures for the various constituents below, outside the following limits, namely:

Carbon....below 0.35 per cent, or above 0.50 per cent.
Manganese .....above 0.60 per cent.
Phosphorus .....above 0.07 per cent.

SYMINGTON M. C. B. FREIGHT JOURNAL BOX WITH TORSION SPRING LID



SYMINGTON M. C. B. FREIGHT JOURNAL BOX WITH FLAT SPRING LID

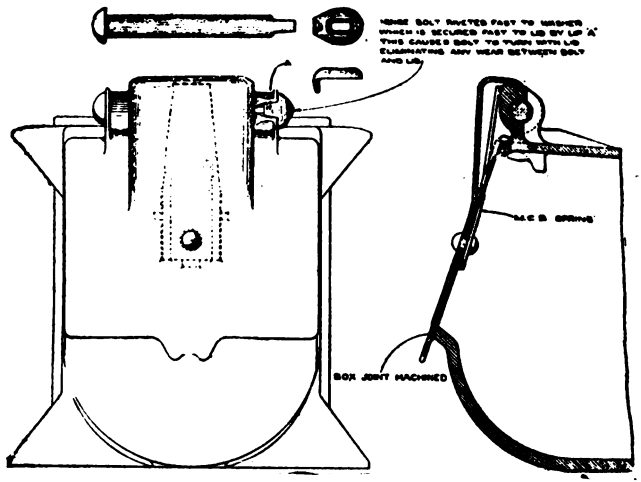


PLATE No. 81.

T. H. Symington Co., Baltimore, Md.

CRECO JOURNAL BOX AND LID

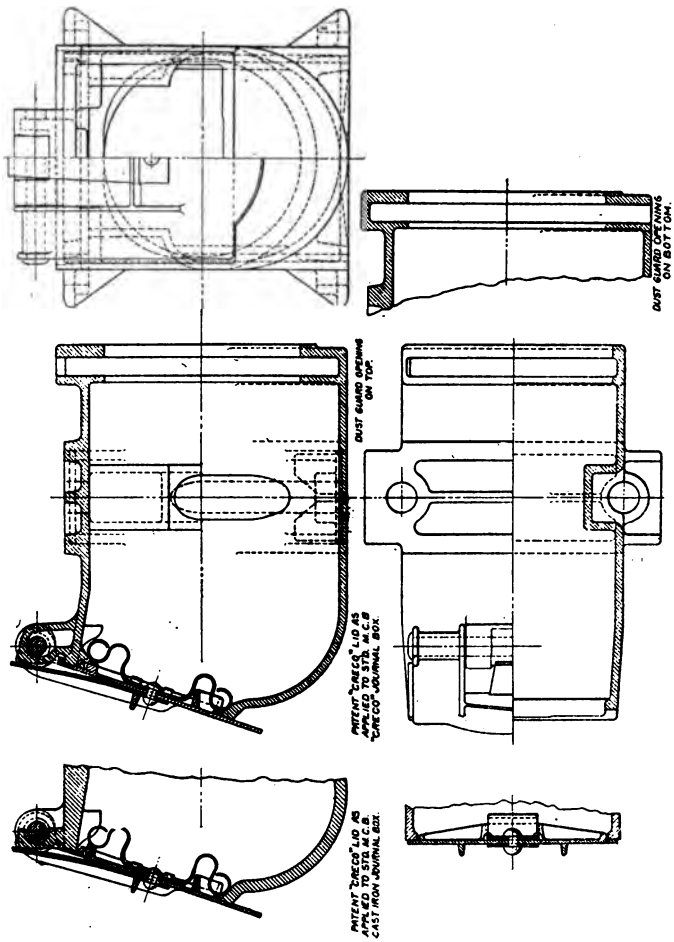
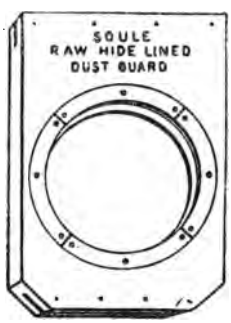


PLATE No. 82.

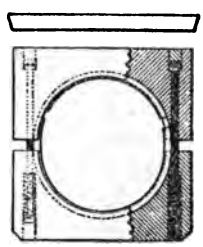
Chicago Railway Equipment Co., Chicago, Ill.

DUST GUARDS—These are inserted in the back of the journal box and fitted closely around the dust guard bearing of the axle. They are to exclude the dust and prevent the escape of oil and waste. Dust guards are made of a thin piece of wood, leather felt, and other material. (See Plate 78 for M. C. B. recommended standard, also Plate 70, Fig. 19, and Plate No. 83 for patented dust guards.)

SOULE RAWHIDE LINED DUST GUARD



HARRISON DUST GUARD



WAYCOTT DUST GUARD

PLATE No. 83.

TRUCK BOLSTERS AND ATTACHMENTS—The truck bolster is a beam which extends from one set of arch bars to the other and is located directly under the body bolster and center plate at each end of the car. (See Plate 70, Fig. 21.) The bolster receives the weight of the car body and its contents, through the center plate, and transmits it to the spring under each end or to the truck hangers, according to the construction of the bolster. Truck bolsters may be divided into two classes, rigid and swing motion. There are numerous designs and makes of both styles, the majority of which are patented.

THE RIGID BOLSTER is one which transmits the load to the arch bars or truck sides by springs, which are called "truck springs," located at each end of bolster, resting on the spring plank, which is supported by the bottom arch and tie bar. These bolsters are made of wood, "usually oak," also of layers of wood and iron, while others are made of metal. The latter is fast taking the place of the two former ones, because a truck bolster cannot be too strong for the constant burden it has to bear.

THE SWING MOTION BOLSTER. In this class of truck bolster the lateral motion is provided for as well as the vertical, the object of providing this swing motion to the bolster is to prevent as much as possible lateral blows and shocks from being communicated to the car body, and vice versa, and prevent the momentum of the car body from acting with its full force on the truck. This is done by having the spring plank on which the truck rests, the same as in the rigid bolster, suspended on two hangers, called truck hangers, or a set of rollers. Those with hangers are supported and held in position by two axles, which pass through holes in the top of the truck hanger and rest on the truck transom or channel bar.

Truck transoms are two cross beams, attached to the arch bars on truck sides, between which the swing beam is placed. They were formerly made of wood, but of recent years nothing but iron is being used.

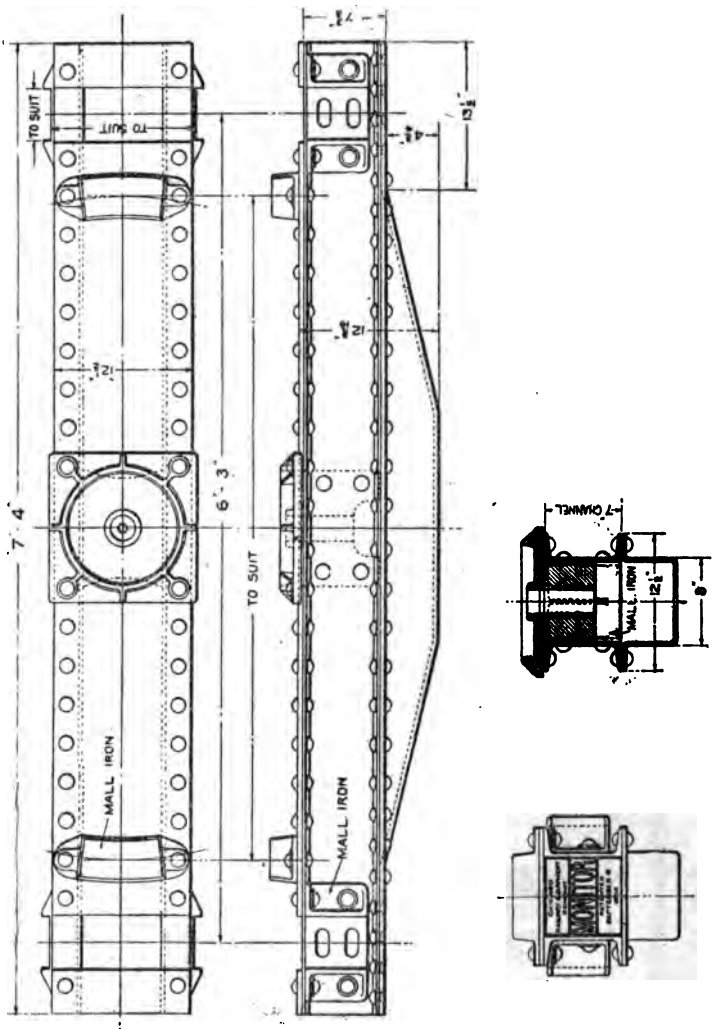


PLATE No. 84.

Chicago Railway Equipment Co., Chicago, Ill.

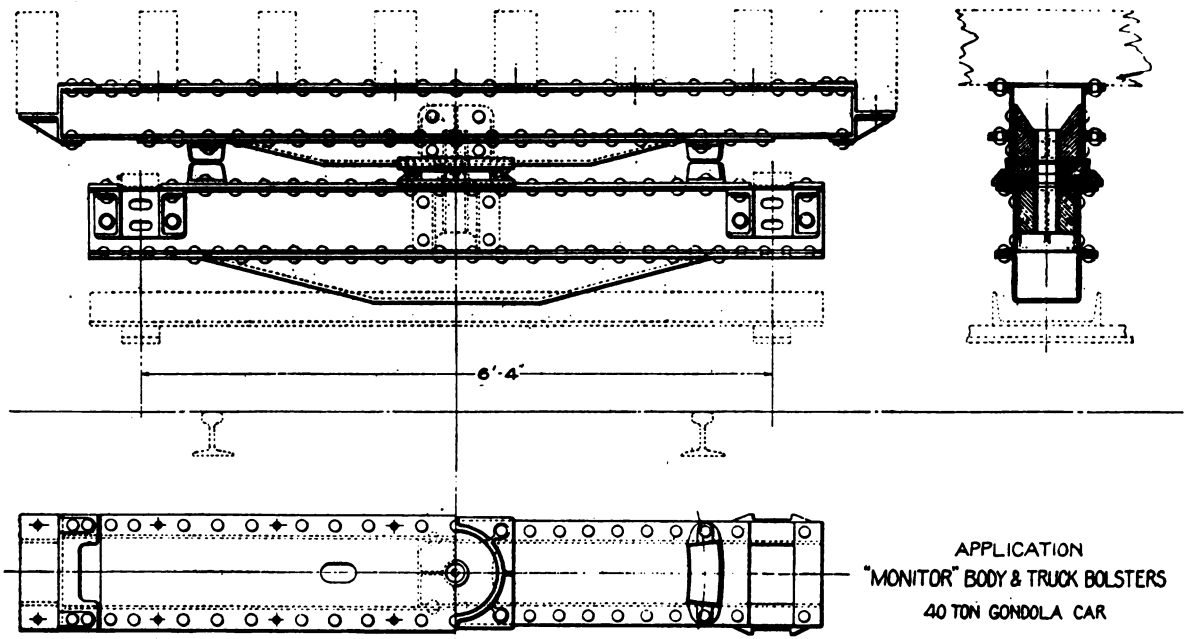


PLATE No. 85.
Chicago Railway Equipment Co., Chicago, Ill.

FOX PRESSED STEEL PEDESTAL TRUCK.

80,000 lbs. Capacity.

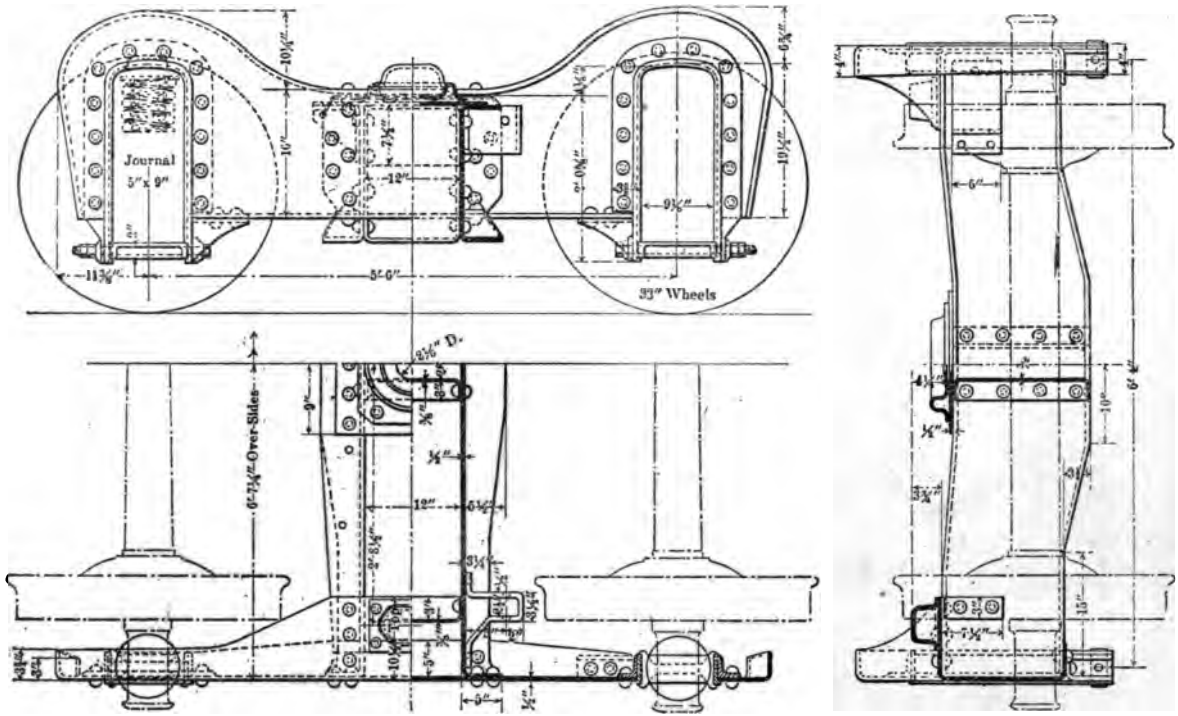


PLATE No. 86.

DIAMOND ARCH BAR TRUCK WITH PRESSED STEEL BOLSTER.

100,000 lbs. Capacity.

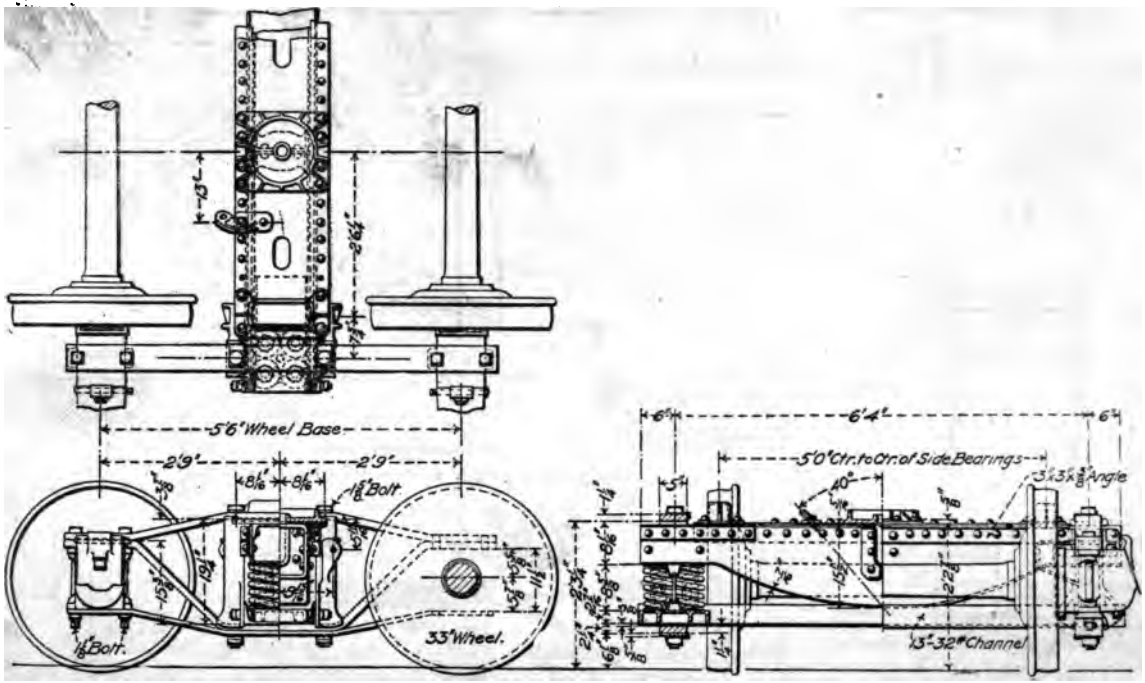


PLATE No. 87.

DIAMOND ARCH BAR TRUCK.

100,000 lbs. Capacity.

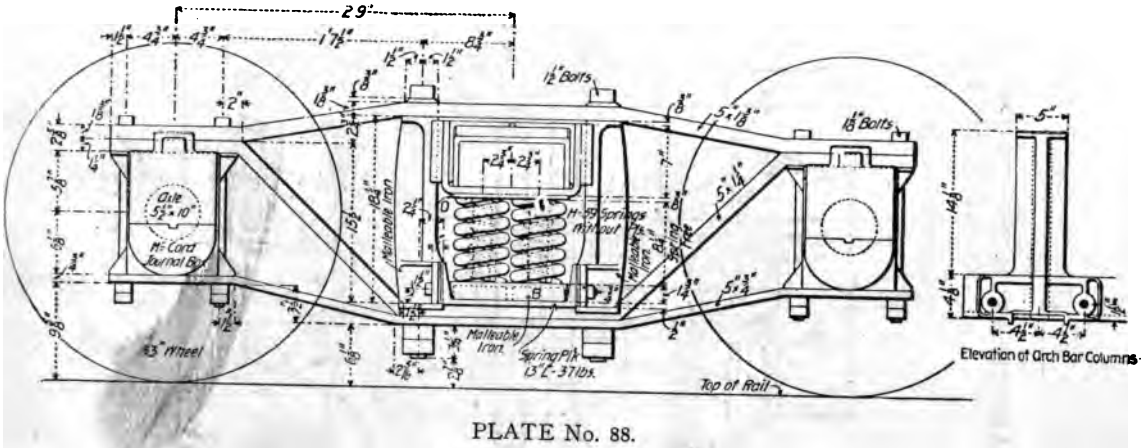


PLATE No. 88.

DIAMOND ARCH BAR TRUCK WITH PRESSED STEEL BOLSTER.

100,000 lbs. Capacity.

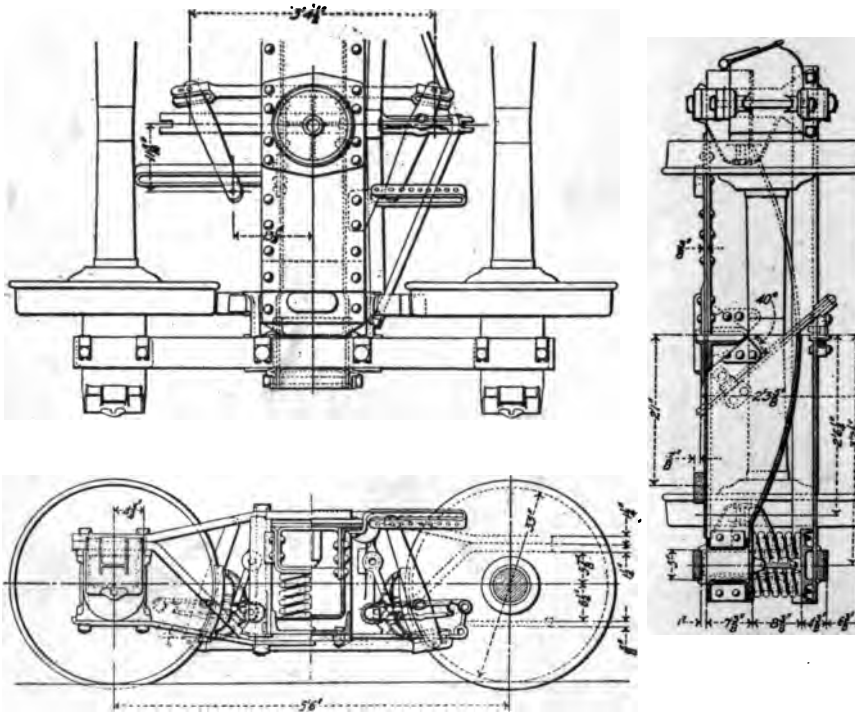


PLATE No. 89.

BARBER TYPE DIAMOND ARCH BAR TRUCK WITH TOP ROLLERS.

80,000 lbs. Capacity.

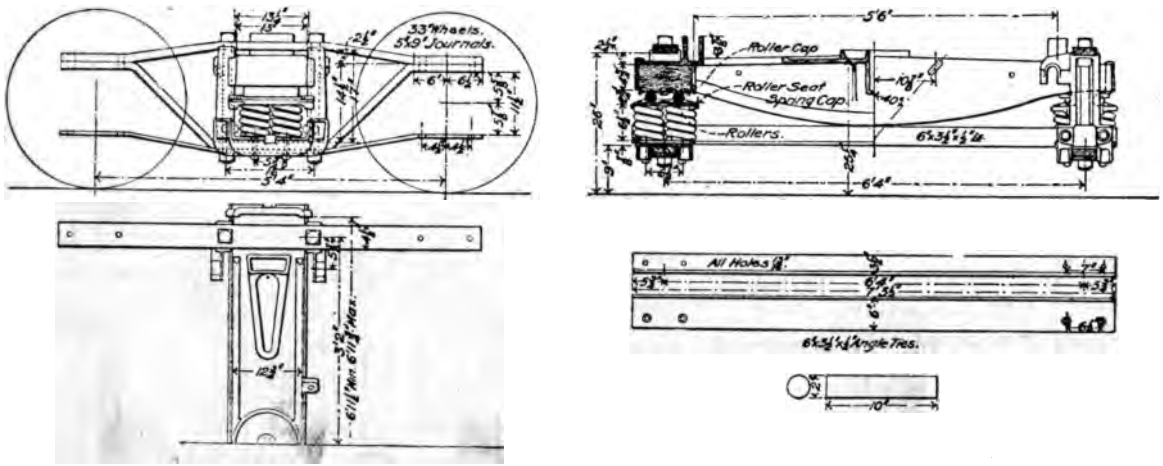


PLATE No. 90.

STANDARD BETTENDORF TRUCK.

80,000 lbs. Capacity.

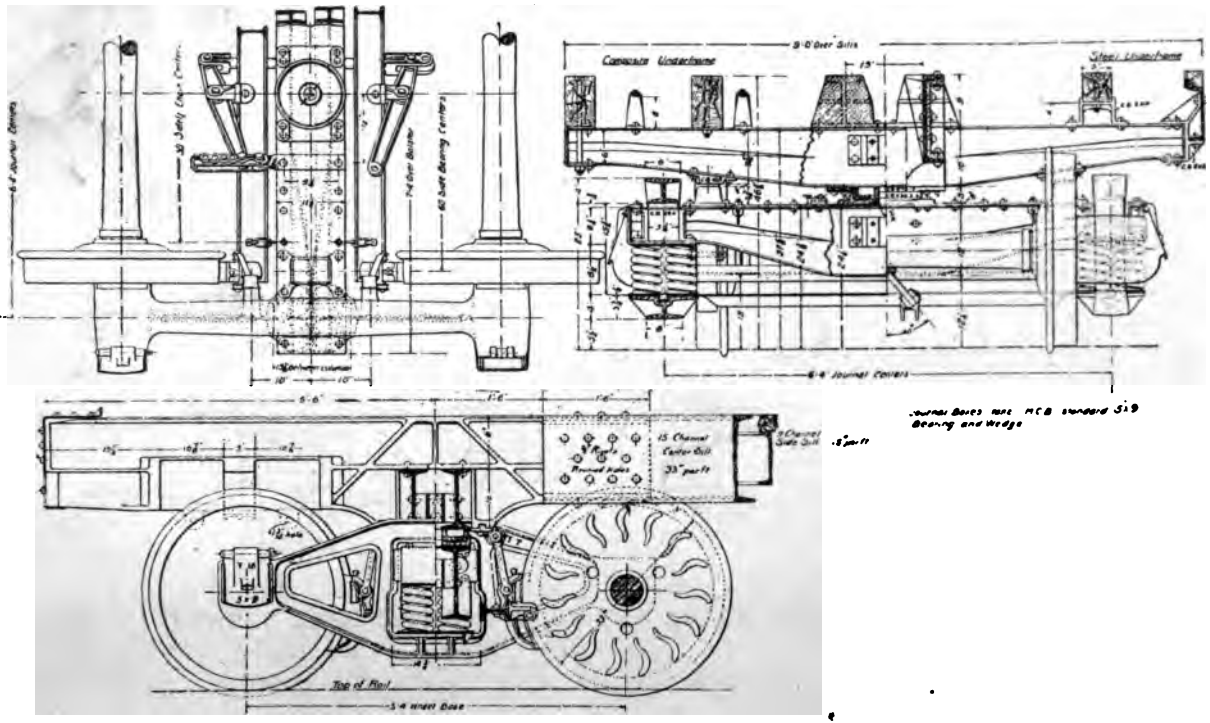


PLATE No. 91.

SIDE BEARINGS are the supports attached to the bolsters, body and truck, near their ends to prevent too much rolling or rocking of the car body on the center plate and to allow the truck to turn freely when the weight of the car is not evenly distributed on the center and the body is tilted over. Usually a plate or block of iron or steel is attached to the body bolster and a corresponding plate, block, roller or ball bearing on the truck bolster. The first is called the body side bearing in distinction from the second which is called the truck side bearing. They are also distinguished as upper and lower side bearings.

CRECO ROLLER SIDE BEARING FOR FREIGHT SERVICE

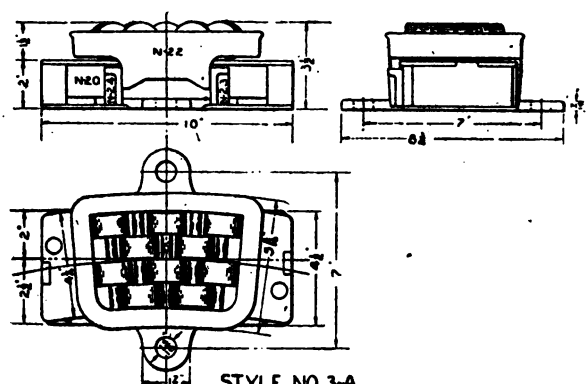
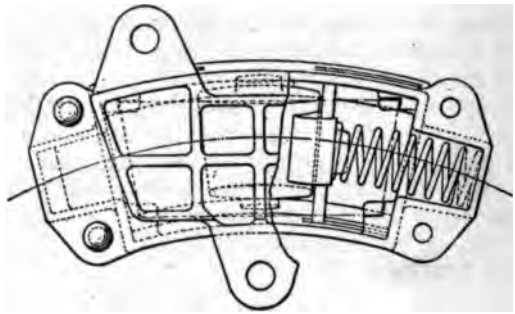
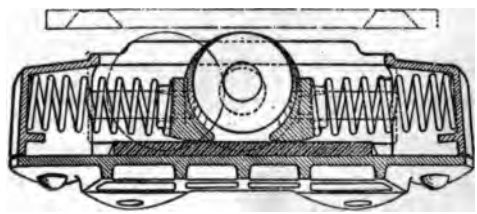


PLATE No. 92.

Chicago Railway Equipment Co.
Chicago, Ill.

BALTIMORE SIDE BEARING





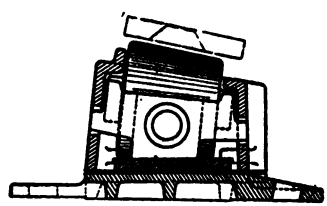


PLATE No. 93.

T. H. Symington Co., Baltimore, Md.

BRAKE BEAMS—Brake beams are transverse iron, steel or wooden bars to which the brake heads and shoes are attached. They are either inner or outer hung.

The Standards, as outlined for iron brake beams by the M. C. B. Association, is shown in Plate 94. The following data gives the dimensions and capacity of brake beams, as adopted by the association, as well as the specifications and tests for same:

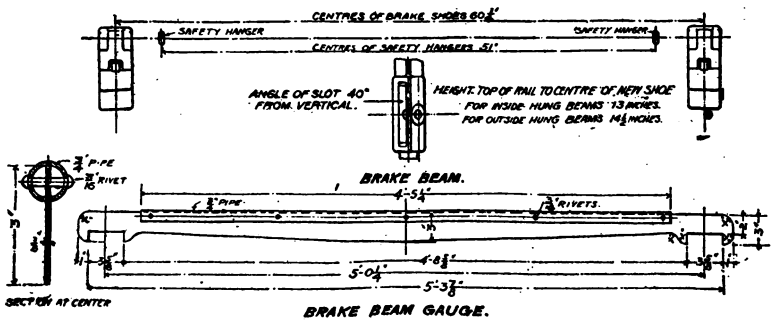


PLATE No. 94.

BRAKE BEAMS.

Certain dimensions and capacities of brake beam were adopted as standard of the Association, by letter ballot, in 1889, and these standards, as modified by subsequent action, are shown on this drawing for iron brake beams.

All beams must be capable of withstanding a load of 7,500 pounds at center without more than 1-16 inch deflection; where it is necessary to use a stronger beam, it must be capable of standing a load of 15,000 pounds at center without more than 1-16 inch deflection.

Standard heights of brake beams, when measured from the

tops of the rails to the center of the face of new shoes, were adopted in 1894, as follows:

For inside hung beams, 13 inches.

For outside hung beams, 14½ inches.

In 1907 the following details for brake beams and gauges were adopted as standard:

All brake beams shall be 60¼ inches in length from center to center of brake head, with an allowable variation of ⅛ inch in either direction.

All brake beams shall be proven by gauge shown on Sheet M. C. B. 17, which shall be the standard gauge for that purpose.

Attachments for safety hangers shall be 51 inches from center to center.

The angle of the lever fulcrum shall be 40 degrees from the vertical.

The lever pin hole shall be either 2 inches or 3 inches in front of the top of the brake head lugs. The variations in either directions from above measurements shall not exceed 1-16 inch. Holes should be made straight and true by drilling, reaming or broaching, and shall be not less than 1 3-32 inches nor more than 1⅛ inches in diameter.

All lever pin holes shall be proven by gauge shown on Sheet M. C. B. 17, which shall be the standard gauge for that purpose.

In 1908 the following detail regarding brake beams was advanced from Recommended Practice to Standard:

Brake beam hangers shall be ⅞ inch in diameter.

In 1908 two brake beams were adopted as standard, as follows:

Brake beam No. 1 to be suitable for cars weighing not over 35,000 pounds light weight.

Brake beam No. 2 to be suitable for cars exceeding 35,000 pounds light weight.

In 1909 the following was adopted to establish a uniform practice for designating right and left hand brake beams:

When facing back of brake beam with center strut pointing away from observer where the top of lever slot inclines toward the right it shall be known as right-hand beam, and where top of lever inclines toward the left it shall be known as left-hand beam.

BRAKE BEAM SPECIFICATIONS AND TESTS.

For each 500 brake beams or less, which pass inspection and are ready for shipment, one representative beam shall be taken at random and subjected by the company manufacturing the

beams, and in the presence of the railroad company's inspector, to the following test in a suitable machine:

The beams shall be equipped with suitable heads and shoes, and the shoes placed in contact with castings representing the tread of the wheel; when mounted in this manner the load shall be applied to the fulcrum in the normal line of pull. As a preliminary to the test a load of 6,000 pounds shall be applied and released, after which observations for records shall be taken. Beam No. 1, under a load of 6,500 pounds shall not deflect to exceed .0625 inch; beam No. 2, under a load of 12,000 pounds, shall not deflect to exceed .0625 inch.

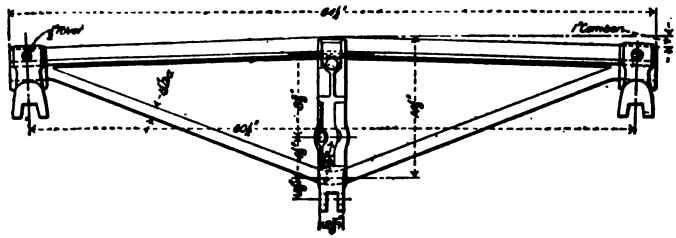
In case a beam shall fail in this test, then a second beam shall be taken from the same lot and similarly tested. If the second beam stands the test it shall be optional with the inspector whether he shall test a third beam or not. If he does not do so, or if he does, and the third beam stands the test, the 500 beams or less shall be accepted as filling the requirements of this test.

Individual beams will not be accepted which (1) do not conform to standard dimensions, and (2) those that have physical defects. Any lot of 500 beams, or less, submitted for test that fail to meet the prescribed test will not be accepted.

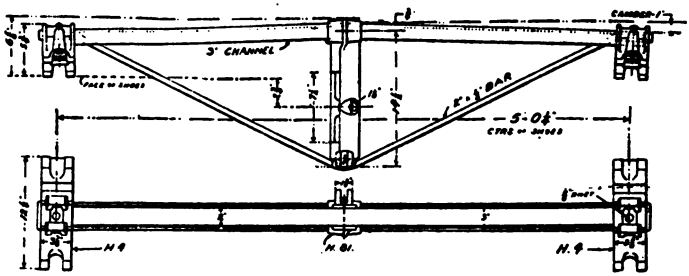
On cars built after September 1, 1909, it will not be permissible to hang brake beams from any portion of the body of the car.

The following illustrations will show the different types of the various metal brake beams now in general use:

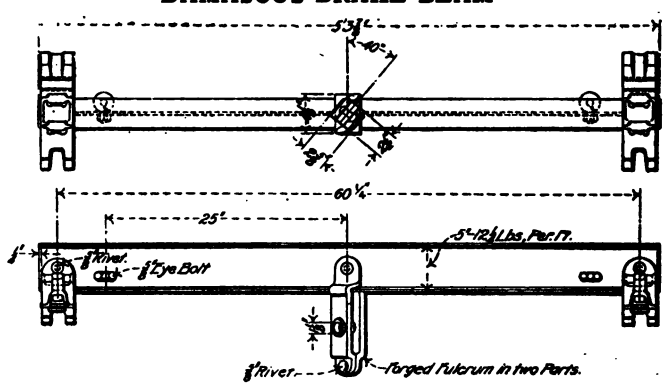
DAVIS SOLID TRUSS BRAKE BEAM.



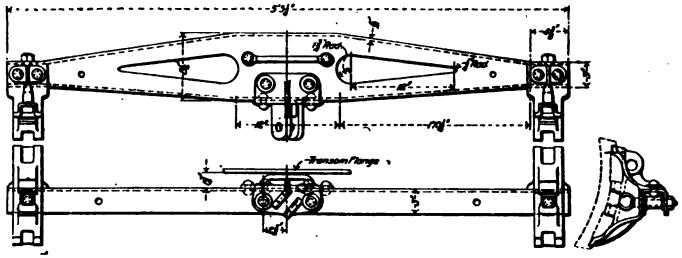
HUNTOON BRAKE BEAM.



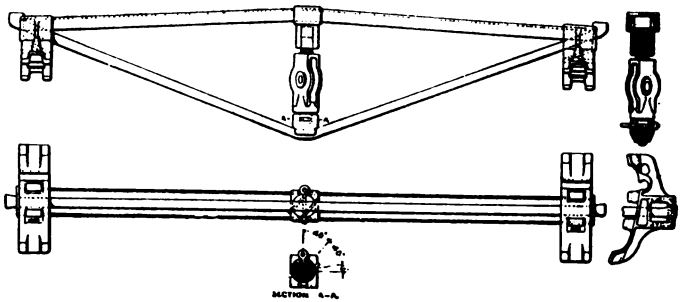
DAMASCUS BRAKE BEAM



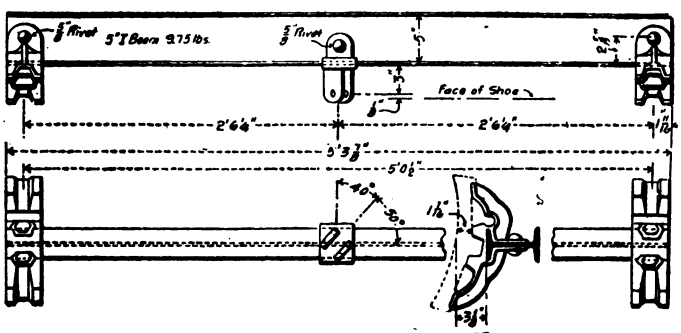
PRESSED STEEL DOUBLE TRUSSED BRAKE BEAM.



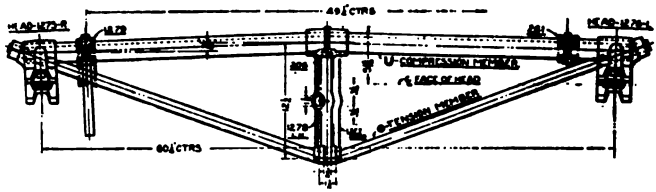
VANDERBILT BRAKE BEAM.



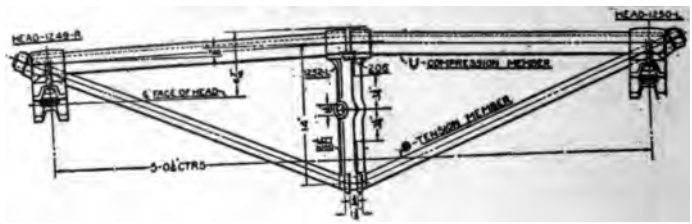
VANDERBILT BRAKE BEAM.



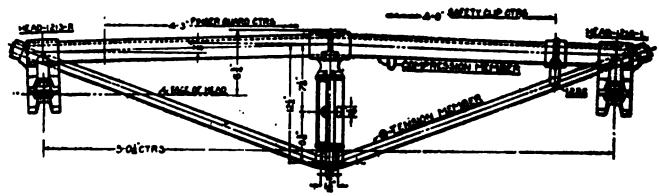
"CRECO" BRAKE BEAM
For A. T. & Santa Fe Ry.



"CRECO" BRAKE BEAM
For C. R. I. & Pac. Ry.

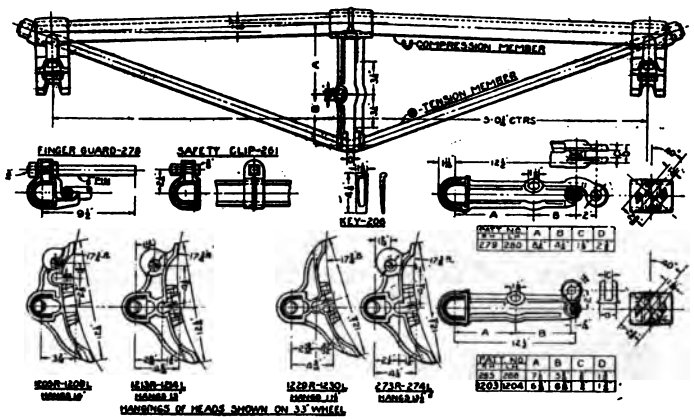


"CRECO" BRAKE BEAM
Reversible Strut.
For Colo. & Southern Ry.

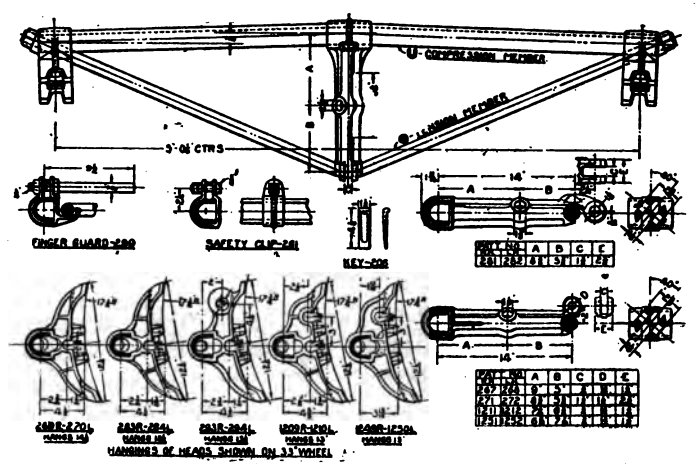


Chicago Railway Equipment Co.
Chicago, Ill.

"CRECO" BRAKE BEAM FOR FREIGHT SERVICE



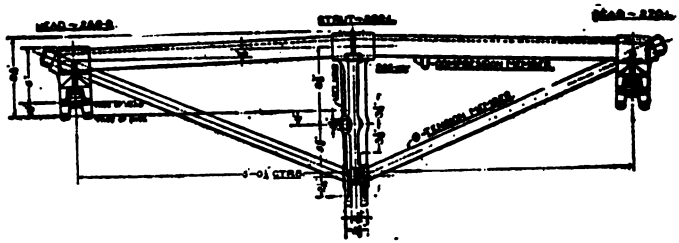
"CRECO" BRAKE BEAM FOR HEAVY FREIGHT SERVICE



Chicago Railway Equipment Co.
Chicago, Ill.

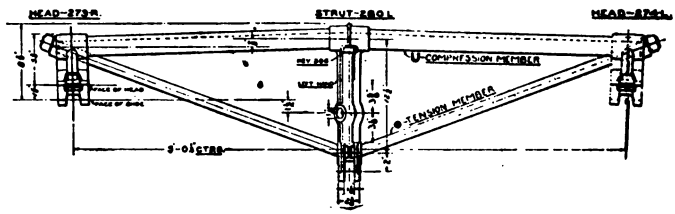
SPECIAL "CRECO" BRAKE BEAM.

P. R. R. Standard.

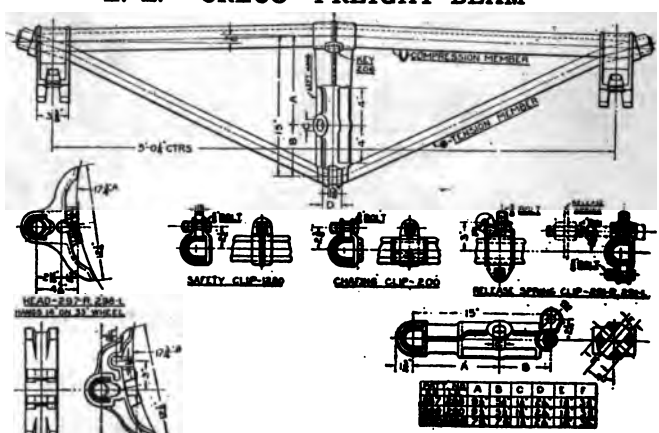


HEAVY FREIGHT "CRECO" BRAKE BEAM

B. & O. R. R. Standard.



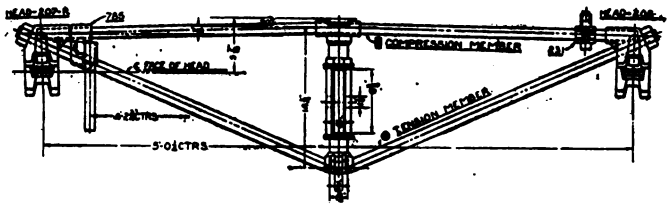
"E. L." "CRECO" FREIGHT BEAM



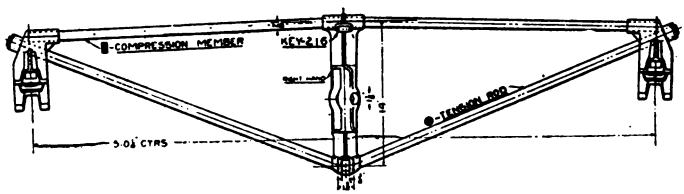
Chicago Railway Equipment Co.
Chicago, Ill.

"DIAMOND REVERSIBLE" BRAKE BEAM

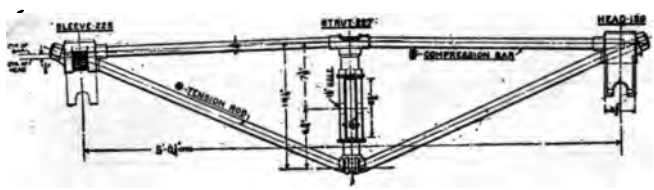
For Freight and Tender Service.



"DIAMOND EXTRA" BRAKE BEAM

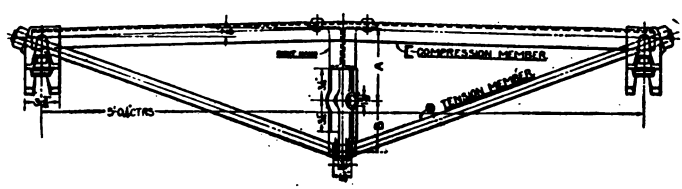


"DIAMOND ADJUSTABLE" BRAKE BEAM



DREXEL FREIGHT BRAKE BEAM

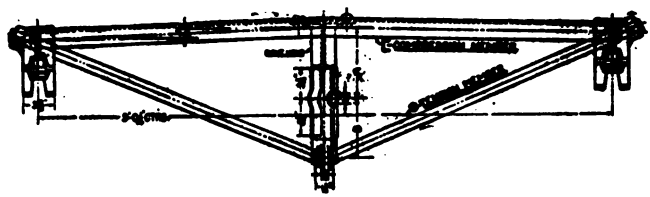
12-In. Truss.



Chicago Railway Equipment Co.
Chicago, Ill.

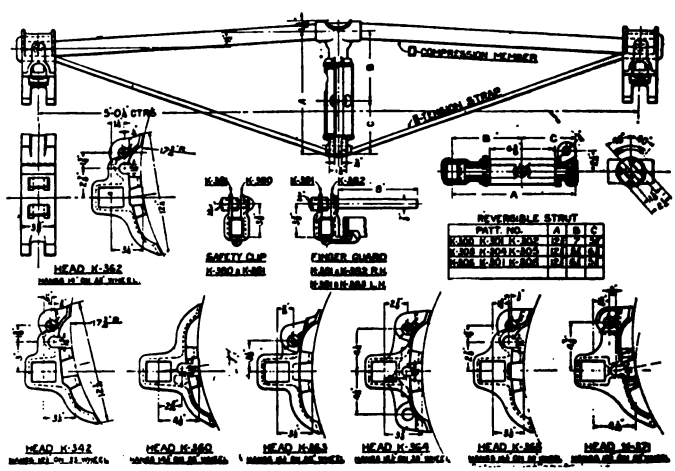
DREXEL FREIGHT BRAKE BEAM

14-In. Truss.



"2-IN. KEWANEE" BRAKE BEAM

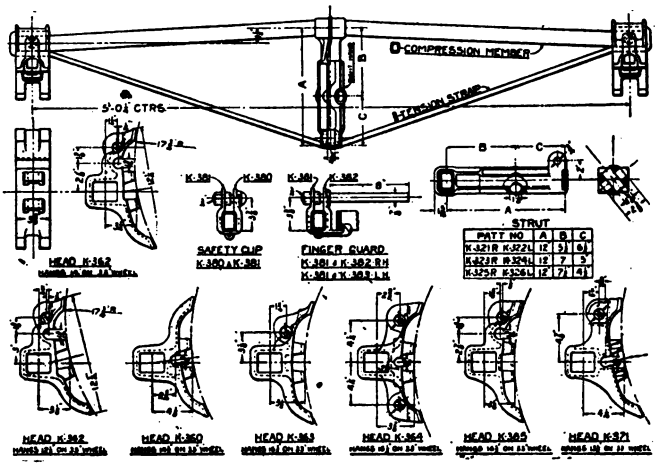
Reversible Strut.



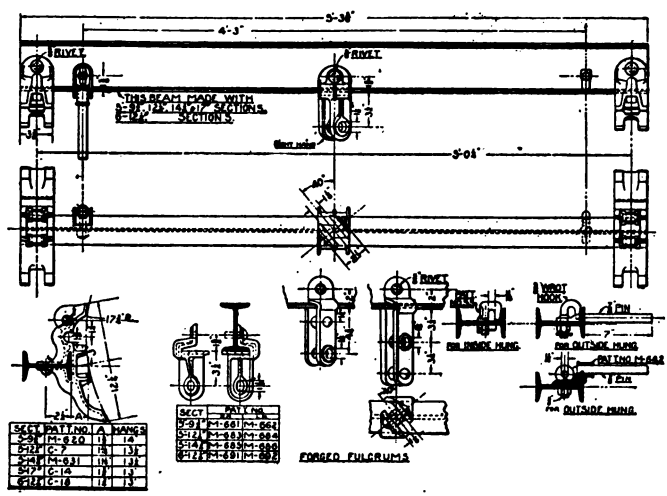
Chicago Railway Equipment Co.
Chicago, Ill.

"2-IN. KEWANEE" BRAKE BEAM

For General Freight Service.



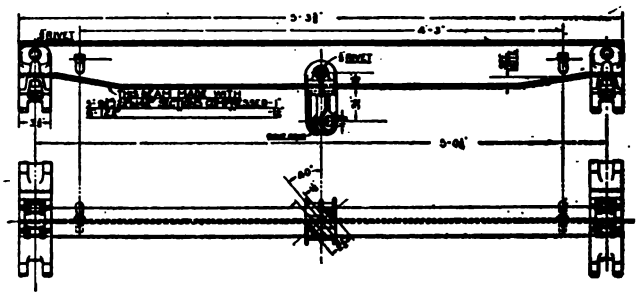
"MONARCH SOLID" BRAKE BEAM



Chicago Railway Equipment Co.
Chicago, Ill.

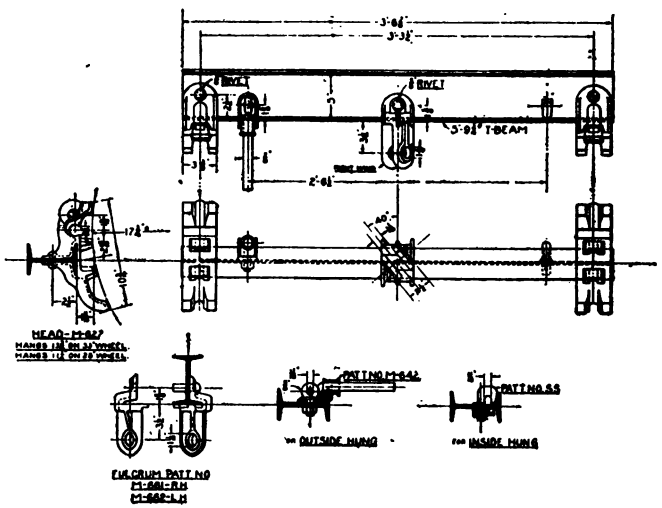
"MONARCH SOLID" BRAKE BEAM

Compressed End.



"MONARCH SOLID" BRAKE BEAM

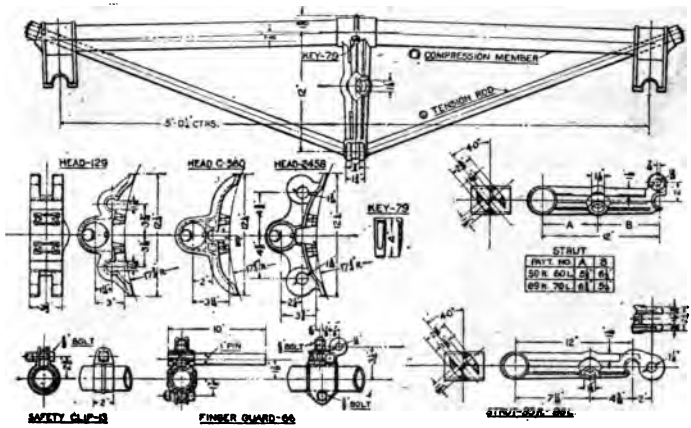
Narrow Gauge.



Chicago Railway Equipment Co.
Chicago, Ill.

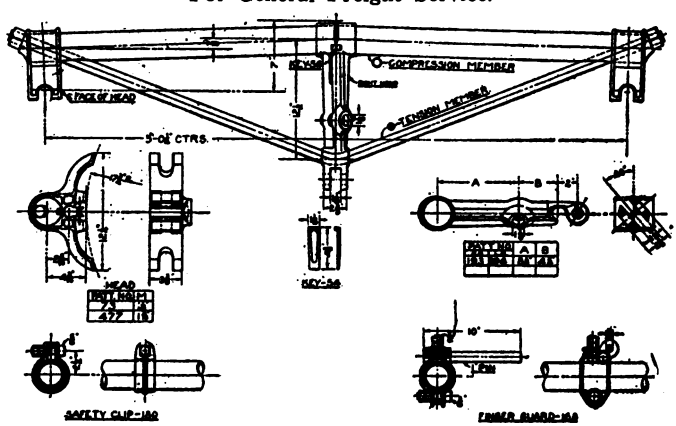
"2-IN. NAT'L. HOLLOW" BRAKE BEAMS

For Freight Service.



"2½-IN. NAT'L. HOLLOW" BRAKE BEAM

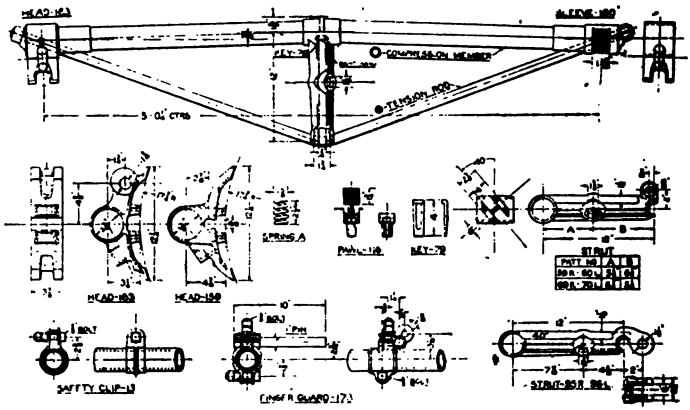
For General Freight Service.



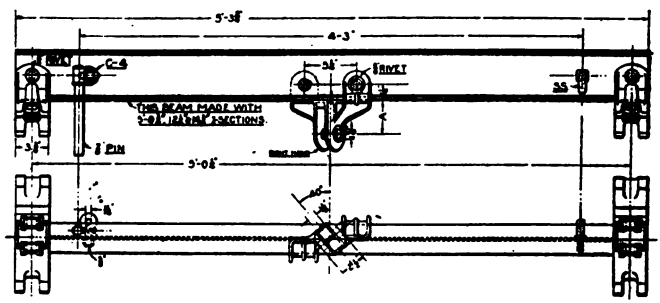
Chicago Railway Equipment Co., Chicago, Ill.

"2-IN. NAT'L. HOLLOW" BRAKE BEAM

Adjustable Heads.

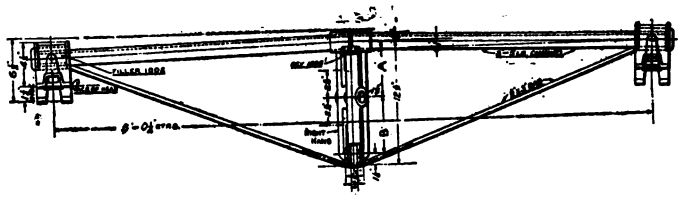


"NINETY-SIX" BRAKE BEAM



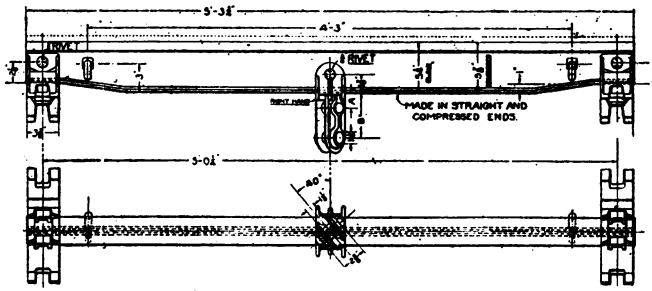
Chicago Railway Equipment Co.
Chicago, Ill.

"RELIANCE" BRAKE BEAM

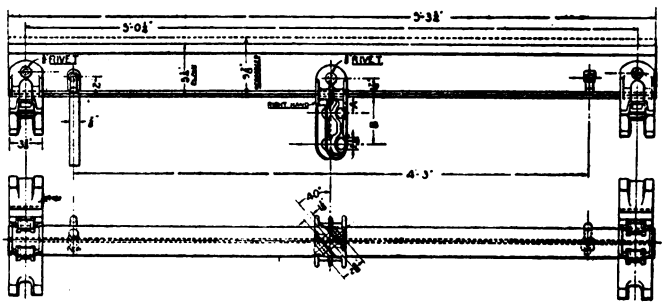


"STERLINGWORTH" BRAKE BEAM

Compressed End.



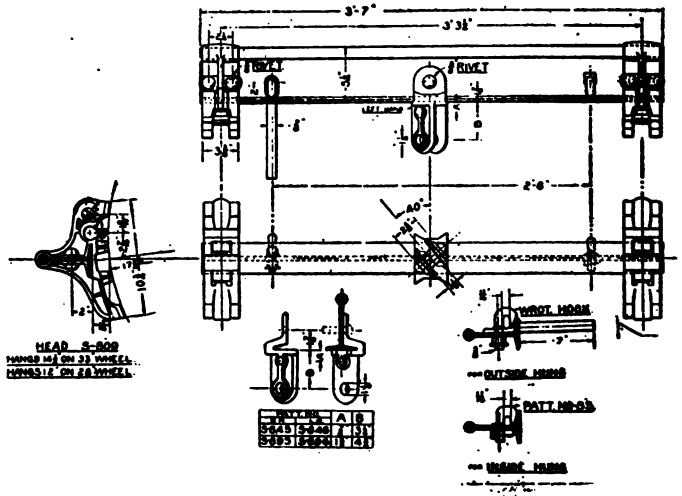
"STERLINGWORTH" BRAKE BEAM



Chicago Railway Equipment Co.
Chicago, Ill.

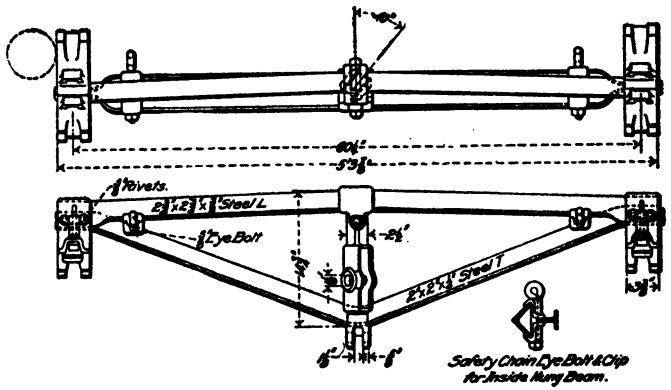
"STERLINGWORTH" BRAKE BEAM.

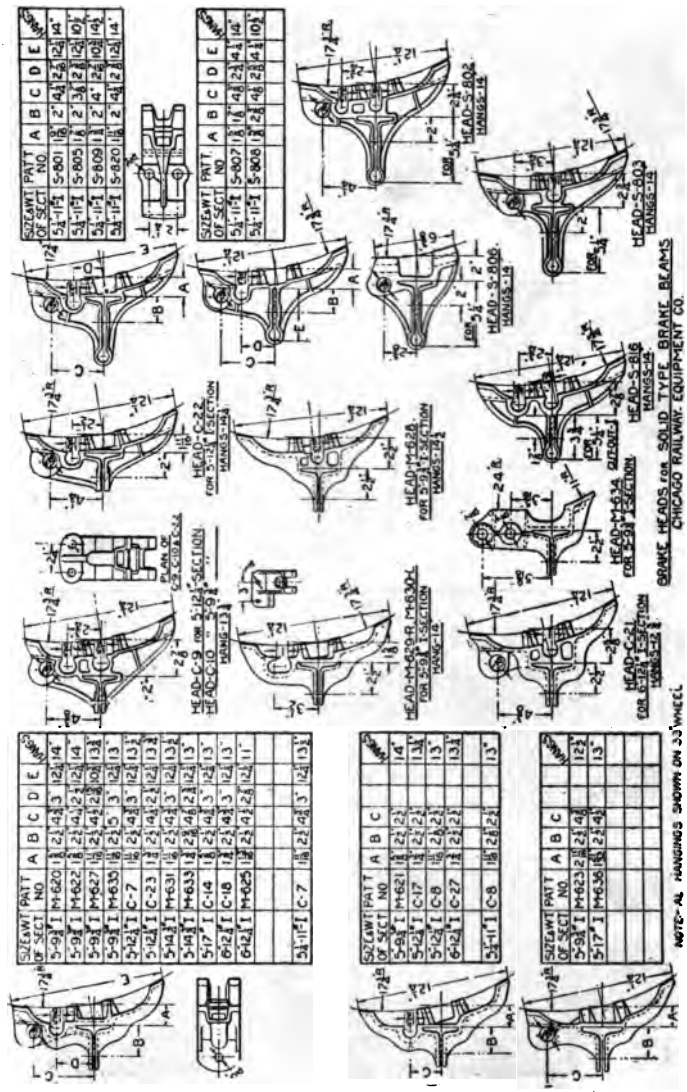
Narrow Gauge

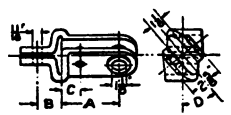


Chicago Railway Equipment Co.
Chicago, Ill.

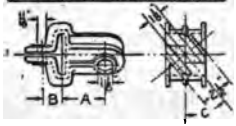
WAYCOTT HEAVY FREIGHT BRAKE BEAM.



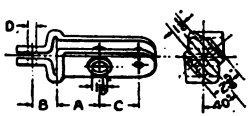

BRAKE HEADS FOR SOLID TYPE BRAKE BEAMS
CHICAGO RAILWAY EQUIPMENT CO.
NOTE- ALL HANGINGS SHOWN ON 33" WHEEL



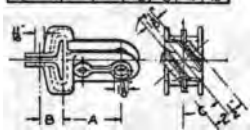
SIZE & WT OF SECT	PATT. NO. RH	LH	A	B	C	D
5'-9½" I	K-2	L-2	4⅜	2"	1½	40°
5'-9½" I	C	D	4⅜	1⅝	1⅜	40°
5'-12¼" I	E	F	4⅜	1⅝	1⅜	40°
5'-12¼" I	A	B	4⅜	1⅝	1½	40°
5'-12¼" I	M-4	N-4	4⅜	1⅝	1½	30°
5'-12¼" I	M-2	N-2	4⅜	2"	1½	40°
5'-14⅜" I	G-2	H-2	4⅜	2"	1½	40°
5'-17" I	I-2	J-2	4⅜	2"	1½	40°
6'-12¼" I	Q-2	R-2	4⅜	2"	1½	40°
6'-12¼" I	S-2	T-2	4⅜	1⅜	1½	40°
5½"-11" I	O-2	P-2	4⅜	1⅜	1½	40°



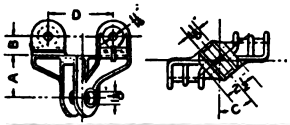
SIZE & WT OF SECT	PATTERN NO. RH	LH	A	B	C
5'-9½" I	M-661	M-662	3½	1⅜	40°
5'-9½" I	M-671	M-672	4⅜	1⅜	40°
5'-9½" I	M-679	M-680	4⅜	1⅜	40°
5'-9½" I	M-681	M-682	5⅛	1⅜	40°
5'-12¼" I	M-683	M-684	3½	1⅜	40°
5'-14⅜" I	M-685	M-686	3½	1⅜	40°
6'-12¼" I	M-691	M-692	3½	1⅜	40°



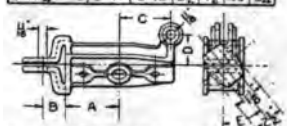
SIZE & WT OF SECT	PATT. NO. RH	LH	A	B	C	D
5'-9½" I	K-1	L-1	3½	2"	3⅛	11/16
5'-9½" I	K-3	L-3	3⅜	2½	3⅛	11/16
5'-12¼" I	M-1	N-1	3½	2"	3⅛	11/16
5'-12¼" I	M-3	N-3	3½	2⅜	3⅛	11/16
5'-12¼" I	Q-3	R-3	3½	2"	3⅛	11/16
5'-12¼" I	S-1	T-1	3½	1⅜	3⅛	11/16
5'-14⅜" I	G-1	H-1	3½	2"	3⅛	11/16
5'-14⅜" I	U-1	V-1	3½	1⅜	3½	11/16
5'-17" I	I-1	J-1	3½	2"	3⅛	11/16
6'-12¼" I	Q-1	R-1	3½	2"	3⅛	11/16
5½"-11" I	O-3	P-3	3⅜	1⅜	3½	11/16
5½"-11" I	O-1	P-1	3½	1⅜	3½	11/16



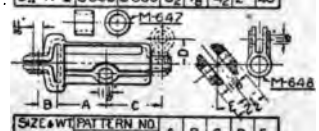
SIZE & WT OF SECT	PATTERN NO. RH	LH	A	B	C
5½"-11" I	S-841	S-842	4⅜	1⅜	40°
5½"-11" I	S-843	S-844	4⅜	1⅜	40°
5½"-11" I	S-845	S-846	3½	1⅜	40°
5½"-11" I	S-895	S-896	4⅜	1⅜	40°
5½"-11" I	S-897	S-898	4⅜	1⅜	28°
6'-12¼" I	C-19	C-20	5⅜	2"	40°



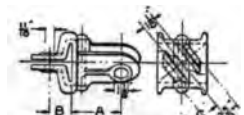
SIZE & WT OF SECTION	PATTERN NO. RH	LH	A	B	C	D
5'-9½" 112½ I	C-1	C-2	3½	1½	40°	5⅛
5'-9½" 112½ I	C-5	C-6	4⅜	1½	40°	5⅛
5'-14⅜" I	C-11	C-12	3½	1½	40°	5⅛



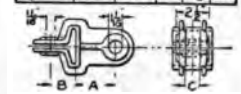
SIZE & WT OF SECT	PATTERN NO. RH	LH	A	B	C	D	E
5½"-11" I	S-855	S-856	5⅛	1⅛	5"	2½	40°
5½"-11" I	S-857	S-858	5⅛	1⅛	5"	2½	40°
5½"-11" I	S-863	S-864	3½	1⅛	4½	2"	40°
5½"-11" I	S-865	S-866	3½	1⅛	4½	2"	40°



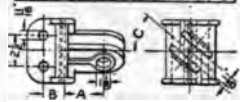
SIZE & WT OF SECT	PATTERN NO. RH	LH	A	B	C	D	E
5'-9½" I	M-667	M-668	4½	1⅛	4⅜	2"	40°
5'-9½" I	M-669	M-670	6"	1⅜	4⅜	2"	40°
5'-9½" I	M-673	M-674	4"	1⅜	4⅜	2"	40°
5'-9½" I	M-677	M-678	4⅜	1⅛	4⅜	2"	40°



SIZE & WT OF SECT	PATTERN NO. RH	LH	A	B	C
5½"-11" I	S-901	S-902	4"	1⅜	40°



SIZE & WT OF SECT	PATTERN NO.	A	B	C
5½"-11" I	S-900	3¼	1⅛	1⅛



SIZE & WT OF SECT	PATTERN NO. RH	LH	A	B	C
5'-12¼" I	C-15	C-16	3¼	1⅜	40°

FULCRUMS
FOR
SOLID TYPE BRAKE BEAMS
CHICAGO RAILWAY EQUIPMENT CO.

AUTOMATIC AIR BRAKE.

For a great many years all train braking was done by manual power or the common hand brake. Later a system of continuous brakes was invented, called the straight air system, which operated by compressed air, the air being compressed by a steam air pump on the locomotive and stored up in a tank called the main reservoir on the engine or tender. By this original form of brake the compressed air was conveyed from the tank by pipes connected together between the cars by flexible brake hose to brake cylinders under each car, by means of which the pressure the air was communicated to the brake levers and thence to the brake shoes.

A later and improved form is the automatic air brake, which is now in universal use. The change made from the original form of the air brake, in order to make it automatic, was to carry a full pressure of air at all times in the brake pipes and cause the brakes to be applied by a reduction of this pressure instead of by the admission of pressure, so that the breaking apart of the train or a reduction of pressure by escape of air at any point on the brake pipe would apply the brakes to the whole train at once. A further advantage was that the action of the brakes was made quicker by saving the appreciable interval of time required for the compressed air to flow from a single reservoir at one end of the train in sufficient quantities to fill all the brake cylinders. An auxiliary reservoir is placed under each car, containing air at the same pressure as in the brake pipes. An ingenious valve called the triple valve connects the brake pipe, auxiliary reservoir and

brake cylinder together in such manner that any reduction of pressure in the brake pipes opens a passage for the air from the auxiliary reservoir to the brake cylinder, applying the brakes, and closes the connection between brake pipe and reservoir. To release the brakes, the pressure in the brake pipes is restored, when the triple valve closes the connection between the auxiliary reservoir and brake cylinder and opens one between the brake cylinder and the outer air and between the auxiliary reservoir and the brake pipe.

The general arrangement and details of M. C. B. Standard for air brakes on freight cars, as well as the standard location of main air pipe and standards for the air brake hose, is shown in Plate 96.

In another part of this book are given complete instructions on the Westinghouse and New York freight air brake, also the defects of same as well as how to locate them.

INSTRUCTIONS TO CAR MEN ON THE FREIGHT AIR BRAKE.

Westinghouse Freight Air Brake.

To properly repair a Freight Car Brake, it is quite essential that it should first be tested, in order that the defect, if possible, may be located.

AUXILIARY FAILS TO CHARGE—If the Auxiliary Reservoir fails to charge or charges too slow, it is due to one of the following defects: Strainer 6 in Brake Pipe Strainer; Strainer 16 in Triple Valve, or Feed Ports, i or K, wholly or partially stopped up or a leak from the Auxiliary Reservoir.

BRAKE FAILS TO APPLY—After Auxiliary Reservoir is charged up, make about a six-pound reduction from the brake pipe and note the effect on the brake. If the brake fails to apply, it is due to one of the following defects: Strainer 6 in Brake Pipe Strainer, or Strainer 16 in Triple Valve, partly stopped up; or a leaky Triple Valve Piston Packing Ring, No. 5; or a sticky Triple Valve Piston.

If brake fails to apply with a six-pound brake pipe reduction, keep reducing the pressure until a twenty-pound reduction has been made. Usually a sticky

Piston will let go before twenty pounds has been reduced, and the brake will apply in emergency.

BRAKE FAILS TO RELEASE—If brake applies and fails to release, after the brake pipe pressure has been increased above that in the Auxiliary Reservoir, it is due to either of the following defects: Strainer 6 in Brake Pipe Strainer, or Strainer 16 in Triple Valve partly stopped up; or a leaky Triple Valve Piston Packing Ring, No. 5; or a sticky Triple Valve Piston.

If when the brake is released there is an exhaust at the triple valve and the Piston No. 3 does not move back to release position it may be caused by a broken release spring or on account of some rod or lever being caught on a bolt or beam under the car or the Cylinder being rusty. If there is no exhaust at retainer and handle on retainer stands straight with pipe it may be on account of the retainer pipe being stopped up.

BRAKE RELEASES—If the Brake applies with a six-pound reduction and then releases, it is due to one of the following defects: When exhaust is heard it may be on account of Graduating Valve No. 7; Slide Valve No. 3; Gasket between Triple and Auxiliary Reservoir; tube in Auxiliary Reservoir leaking, or a leak from Auxiliary Reservoir. When no exhaust is heard it may be on account of Packing leather in Brake Cylinder leaking or Gasket No. 14 between Brake Cylinder and Auxiliary Reservoir leaking.

BRAKE APPLIES IN EMERGENCY—If the brake applies in emergency with a service application

it is due to one of the following defects: A sticky Triple Valve Piston and Slide Valve; a broken Graduating Valve Pin, or a broken Graduating Stem Spring. A sticky Triple Valve Piston and Slide Valve is the most common defect which causes this action.

LEAKS FROM TRIPLE VALVE EXHAUST PORT—If a Triple Valve leaks at the Exhaust Port it is due to one of the following defects: Emergency Valve, No. 10, leaking; Gasket No. 14 in lower Triple Valve Body leaking; Slide Valve, No. 3, not seating properly, or the seat being cut; Gasket between Triple Valve Body and the Auxiliary Reservoir leaking; or a leaky Auxiliary Reservoir tube.

Emergency Valve, No. 10, leaking is the most common defect and it can be stopped in a majority of cases by jarring the Triple Valve, or by applying the brake in emergency.

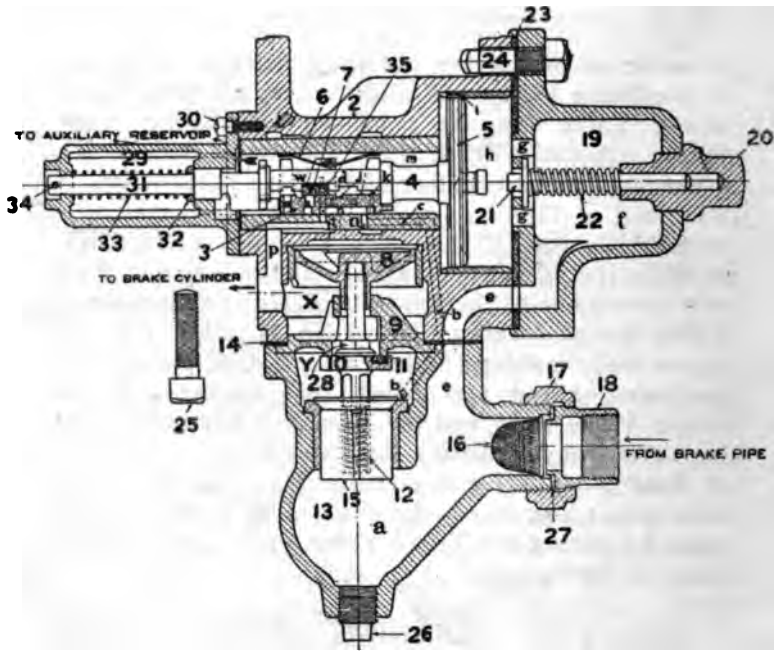
REMOVING, CLEANING AND REPAIRING TRIPLE VALVE—In removing Triple Valve from car, first close the Cut Out Cock, then disconnect the Branch Pipe by unscrewing Union Nut No. 17; after Branch Pipe is disconnected, remove Strainer No. 16, then open the Cut Out Cock and allow the air to blow freely through the Branch Pipe to blow out the dirt and rust, and also see if Strainer 6 in Brake Pipe Strainer is open.

After the Branch Pipe has been disconnected, remove Nuts No. 12 from Auxiliary Studs and take down Triple Valve. It is quite essential that the Triple Valve should be removed from Auxiliary Reservoir, in order to clean and repair it properly.

In removing the Triple Valve from Auxiliary Res-

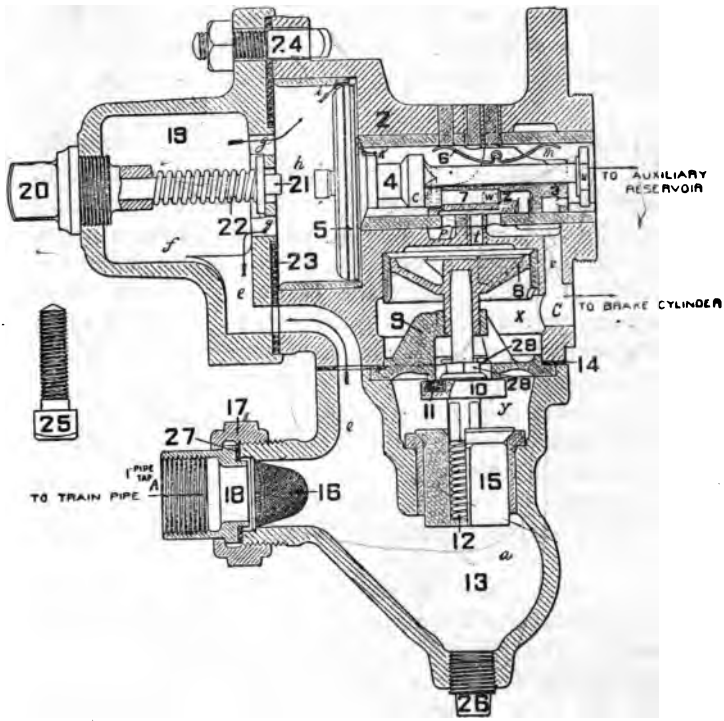
K-1 QUICK ACTION FREIGHT TRIPLE VALVE

(Westinghouse).



2 Body, complete (includes 36).
3 Slide Valve.
4 Main Piston (includes 5).
5 Main Piston Ring.
6 Slide Valve Spring.
7 Graduating Valve.
8 Emergency Piston.
9 Emergency Valve Seat.
10 Emergency Valve (includes 11 and 28).
11 Rubber Seat.
12 Check Valve Spring.
13 Check Valve Case, complete (includes 26).
14 Check Valve Case Gasket.
15 Check Valve.
16 Strainer.
17 1" Union Nut.
18 1" Union Swivel.
19 Cylinder Cap.
20 Graduating Stem Nut.
21 Graduating Stem.
22 Graduating Spring.
23 Cylinder Cap Gasket.
24 Bolt and Nut (for cylinder cap).
25 Cap Screw.
26 ½" Pipe Plug.
27 ½" Union Gasket.
28 Emergency Valve Nut.
29 Retarding Device Body.
30 Retarding Device Screw.
31 Retarding Stem.
32 Retarding Spring Collar.
33 Retarding Spring.
34 Retarding Stem Pin.
35 Graduating Valve Spring.
36 ¾" Plug for Exhaust Outlet (not shown).
* Triple Valve Gasket.

QUICK ACTION FREIGHT TRIPLE VALVE



2 Triple-Valve Body (bushed).
3 Slide Valve.
4 Piston (includes No. 5).
5 Packing Ring.
6 Slide Valve Spring.
7 Graduating Valve.
8 Emergency Valve Piston.
9 Emergency Valve Seat.
10 Emergency Valve.
11 Rubber Seat.
12 Check-Valve Spring.
13 Check-Valve Case.
14 Check-Valve Case Gasket.
15 Check-Valve.
16 Strainer.
17 Union Nut.
18 Union Swivel.
19 Cylinder Cap.
20 Graduating-Stem Nut.
21 Graduating-Stem.
22 Graduating Spring.
23 Cylinder Cap Gasket.
24 Bolt and Nut.
25 Half-Inch Cap Screw.
26 Half-Inch Plug.
27 Union Gasket.
28 Emergency-Valve Nut.
29 Cotter Pin.
30 Plug for Exhaust Outlet.

ervoir, care should be taken so as not to injure the Gasket between the Triple Valve and Auxiliary Reservoir, as it sometimes sticks to the Auxiliary and is destroyed when the Triple Valve is taken down.

CLEANING TRIPLE VALVE—In cleaning Triple Valve, first remove Cylinder Cap No. 19, and remove Triple Piston and Slide Valve. In removing Piston, be careful not to bend the Triple Piston Stem, which can be easily done if the Piston is not taken out perfectly straight. After the Piston and Slide Valve have been removed, it is a good idea to place the same in kerosene oil and let them remain there while cleaning the other parts.

The emergency parts should then be removed and cleaned, and replaced without oiling, as the emergency parts of the Triple Valve are seldom used and oiling them simply serves to collect dirt, and oil getting on the rubber seated Emergency Valve No. 10, would destroy it.

In cleaning the Triple Piston Packing Ring, it should be done without removing the Ring from the Piston, as the Ring can seldom be removed without being broken or sprung out of true.

To clean the Graduating Valve No. 7, remove Pin from Slide Valve Spring No. 6, and Slide Valve from Piston Stem, which will then allow the Graduating Valve to be removed. After cleaning parts thoroughly, then assemble parts.

Thoroughly clean out Feed Port i, in Piston Bushing, and also Port K, in Triple Valve Piston.

Previous to replacing the Piston and Slide Valve in Triple Valve, they should be lightly oiled. Enough oil can be held on the end of the finger to oil all parts

of the Triple Valve. Too much oil is a detriment, as it gums up the Valve and collects dirt.

In replacing the Piston in Triple Valve, be careful in entering the Piston Packing Ring so as not to injure it.

Before replacing Cap 19, on Triple Body, force the Graduating Stem back with the thumb to see if the Graduating Spring is in good order.

Before replacing Triple Valve on Auxiliary Reservoir, always place Body Gasket over the shoulder on the Triple Valve face and not on the Auxiliary Reservoir, as in placing the Gasket on the Reservoir, the edges of the Gasket are liable to be pinched off when the Triple Valve is tightened up, and the particles of rubber getting into the Valve will often cause it to fail to operate.

Clean out Strainer 16 and replace it in Triple Valve; before tightening up Union Nut 17, see that the Gasket is in good condition.

DEFECTS AND THEIR REMEDIES—If Strainer 6, in Brake Pipe Strainer, or Strainer 16, in Triple Valve, are stopped up, they will have to be removed and the dirt blown out.

If the Triple Piston Packing Ring is worn or broken, it should be replaced with a new one; in replacing the new ring, it should be a snug fit in the bushing, and both ends of the Ring should just meet when Piston is replaced in same.

A leaky Slide Valve will have to be removed and refaced. Also seat in bush faced and valve ground to seat.

If the Graduating Valve leaks, it can be easily

ground in by using some fine powdered emery, by placing a screw driver in the slot in the head.

If the Graduating Valve Pin is broken off, unsolder the old one and replace with a new one, which should be securely soldered in.

If the Graduating Spring 22 is broken, it can be removed by unscrewing Nut 20; in replacing a new one, be sure that it is the right size spring for whatever triple valve you may be cleaning.

In replacing a Rubber Seat on the Emergency Valve, first remove Cotter Pin 29, and unscrew Nut 28, which will then allow the Rubber Seat to be removed.

If Check Valve 15 leaks, it can be easily ground in by using some fine powdered emery until a good bearing is formed.

If Check Valve Case Gasket 14, or Triple Valve Body Gasket leaks, they should be replaced with a new one.

If it is necessary to replace Gasket 32, the new Gasket should be of the standard thickness, as furnished by the A. B. Co.

BRAKE CYLINDER

CLEANING AND OILING—To clean and oil a Brake Cylinder properly, the Piston should be removed from the Cylinder; before loosening Cylinder Head 4, to remove Piston, a clamp should be placed on the Piston Sleeve, close to the Cylinder Head, so as to hold the Piston and Head together when Head is removed from the Cylinder, and not allow the Release Spring No. 9 to expand. Remove the Cylinder

Head 4, and take out Piston; after Piston is removed, the walls of the Cylinder should be wiped clean with a piece of waste saturated with kerosene oil; also thoroughly clean the Leakage Groove, A.

In cleaning Piston, 3, the Expander Ring, 8, should be removed, and it and the groove in which it rests should be thoroughly cleaned. Before replacing the Expander Ring, a small amount of oil should be put into the groove.

The Cylinder Walls should be thoroughly greased before the Piston is replaced. In oiling the Cylinder through the Oil Plug, be careful and not put in too much oil, that when the piston goes to release position, the oil will be forced through Auxiliary tube and into Triple Valve.

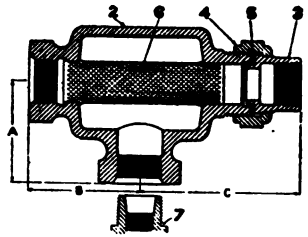
(The practice of oiling through Plug is not recommended and is not in practice on most Roads. A grease of the many kinds on the market, for this purpose, is recommended instead of oil.) The groove around Packing Leather should be filled with the Compound.

When replacing Piston in Cylinder, be careful and see that the Expander Ring does not get out of place.

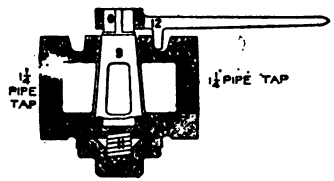
DEFECTS IN CYLINDER AND THEIR REMEDIES—If the Packing Leather, 7, is dry and cracked, or worn so that it leaks, remove Follower, 6, and take off old leather and replace with a new one; when replacing a new Packing Leather, always place the rough side of the leather next to the walls of the Cylinder.

If the Release Spring, 9, is weak or broken, so that it will not force Piston to release position, remove Head, 4, and replace with a new spring.

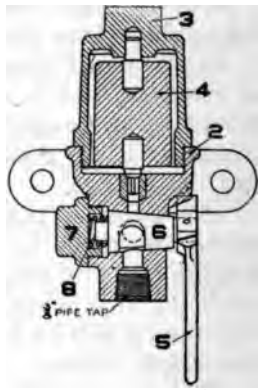
WESTINGHOUSE FREIGHT AIR BRAKE PARTS



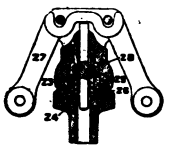
BRAKE PIPE STRAINER.



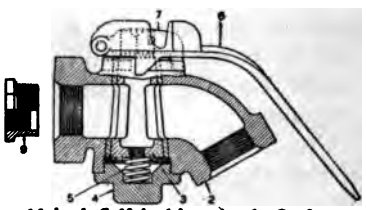
1¼-inch Cut-out Cock.



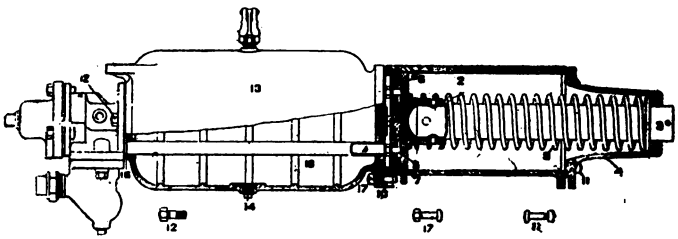
Pressure Retaining Valve.



Release Valve.



1¼-inch Self-locking Angle Cock.



TYPE C, 8″ x 12″ FREIGHT BRAKE CYLINDER AND RESERVOIR COMBINED.

Improved Pressure-Retaining Valve Complete.

No.

2 Retaining-Valve Body (includes Nos. 5, 6, 7 and 8)
3 Retaining-Valve Case
4 Retaining-Valve Weight
5 Retaining-Valve Handle
6 Retaining-Valve-Cock Key
7 Retaining-Valve-Cock Cap
8 Retaining-Valve-Cock Spring

Type C, 8"x12", Freight Brake Cylinder and Reservoir Combined.

2 Cylinder Body, 8"x12"
3 Piston and Rod (includes 5 only)
4 Non-Pressure Head
5 Follower Stud and Nut
6 Follower
7 Packing Leather
8 Packing Expander
9 Release Spring
10 Cylinder Gasket
11 Cylinder Head Bolt and Nut
12 Reservoir Stud and Nut
13 Reservoir (includes 12, 14 and 16)
14 Drain Plug
*15 Triple Valve Gasket
16 Reservoir Tube
17 Reservoir Cylinder Bolt and Nut

1¼-inch Brake Pipe Strainer.

No.

2 1¼"x1¼"x1¼" Strainer Body (includes 6)
3 1¼" Union Swivel
4 1¼" Union Nut
5 1¼" Union Gasket
6 Strainer

Release Valve, Complete.

23 Cylinder (bushed)
24 Stud
25 Vent Valve, complete
26 Spring
27 Handle
28 Rubber Seat

1¼-inch Cut-Out Cock.

8 Body (bushed)
9 Key
10 Cap
11 Spring
12 Handle

Self-Locking Angle Cock.

2 Body (bushed)
3 Key
4 Cap
5 Spring
Handle, complete (includes 6 and 7)
6 Handle, only
7 Handle Socket
9 1¼-inch x 1-inch Bushing

If Cylinder Gasket, 14, leaks, remove Cylinder Body, 2, from Auxiliary and replace with a new Gasket.

RELEASE VALVE—If the Release Valve leaks, it may be due to the rubber seated Vent Valve, 25, being worn; or the Release Valve Spring, 26, being weak.

If the rubber seated Vent Valve is leaking, remove Cap, 23, and replace Rubber Seat; if the Spring, 26, is weak, stretch out Spring, or replace with a new one.

ANGLE COCK LEAKING—If the Angle Cock leaks, grind in Key, 2, with some powdered emery; if Key, 2, leaks around the top, it can sometimes be stopped by removing Cap, 3, and stretching out Spring, 4, as it often becomes weak and does not hold Key up tight in Bushing.

The same rule that applies to Angle Cocks, applies to the Cut Out Cock.

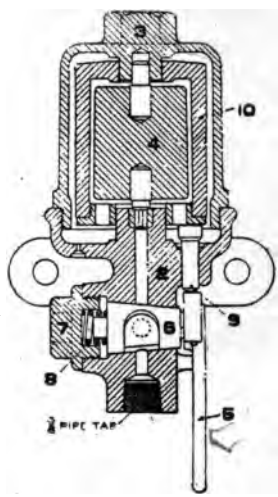
PRESSURE RETAINING VALVE—To test a Pressure Retaining Valve, the handle should be turned up and the brake applied, and then released; after the air stops blowing through the small Port in Retainer Body, wait a few seconds and then turn the handle down; if air discharges freely through the opening in the Retainer, Cock 6, the Retainer may be considered in good condition.

If no air escapes when Retainer Handle is turned down, it may be due to one of the following defects: The Pipe leading from Triple Valve to Retainer Valve, leaking, or the weighted Valve, 4, in Retainer, leaking, or packing leather in Cylinder, leaking.

If the weighted valve, 4, is leaking, remove Retainer Cap, 3, and grind in the Valve Seat with some fine powdered emery.

Usually the Retainer Pipe leaks at the Union Connection that connects Retainer Pipe to the Triple Valve.

PRESSURE RETAINING VALVE FOR HIGH AND LOW PRESSURES, 25 OR 50 LBS. RETAINER FOR HEAVY FREIGHT CARS—It has 2 separate weighted valves, one of the Ordinary form



25-50 lb. Valve, For 6-inch and 10-inch Brake Cylinders.

Body, complete (includes Nos. 5, 6, 7 and 8).
2 Body (bushed).
3 Case.
4 Inside Weight, complete.
5 Handle.
6 Cock Key.
7 Cock Cap.
8 Cock Key, Spring.
9 Weight Lifting Rod.
10 Outside Weight, complete.

and the other being of an inverted cup shape resting on the top of the ordinary weight, when the handle points downward, valve is inoperative and the pressure from the Brake Cylinder can escape freely to the atmosphere. When the handle stands at an angle of 45 degrees the 50 lbs. retainer is in service but when the handle stands horizontal the 25 lbs. retainer is in service, by the lug on the handle coming in contact with the pin which extends down through the outer casing and raising it up at the same time it moves the inverted cup weight up off the ordinary weight and leaves the 25 lbs. retainer in service.

NEW YORK FREIGHT AIR BRAKE.

AUXILIARY FAILS TO CHARGE—If the Auxiliary fails to charge or charges too slow, it is due to one of the following defects: Strainer, D. C. 35, in Brake Pipe Strainer, Strainer, Q. T. 28, in Triple Valve ,or Feed Port B, wohlly or partly stopped up, or a leak in the Auxiliary Reservoir.

BRAKE FAILS TO APPLY—If the brake fails to apply, it is due to one of the following defects: Strainer, D. C. 35, in Brake Pipe Strainer, partly stopped up; or Strainer, Q. T. 28, in Triple Valve partly stopped up; or a leaky Triple Valve Piston Packing Ring, Q. T. 3; or a sticky Triple Valve Piston, Q. T. 128F.

BRAKE FAILS TO RELEASE—If the brake fails to release after the train pipe pressure has been increased above that in the Auxiliary Reservoir, it is due to one of the following defects: Strainer, D. C. 35, in Brake Pipe Strainer, partly stopped up; or Strainer, Q. T. 28, in Triple Valve partly stopped up; or a leaky Triple Valve Piston Packing Ring, Q. T. 3; or a sticky Triple Valve Piston, Q. T. 128F.

BRAKE RELEASES—If the brake applies with about a six-pound train line reduction and then immediately releases, it is due to one of the following defects: A leaky Slide Valve, Q. T. 38; or a leaky Graduating Valve, Q. T. 48; or Quick Action Valve, Q. T. 138, leaking; or a leaky Gasket between Auxiliary and Triple Valve, or Auxiliary Pipe leaking.

If the brake releases after a twenty-bound train line reduction has been made, it is due to a leaky Slide

Valve; or Quick Action Valve, Q. T. 138; or a leak from Auxiliary Reservoir.

A leaky Packing Leather in Brake Cylinder will also cause a brake to release, or a leaky Cylinder Gasket, B. C. 871, but the air will not blow through the Exhaust Port of Triple when brake is releasing. If the air blows through the square Vent Holes, Ports J. and the brake releases, it is due to Check Valve, Q. T. 138, leaking.

BRAKE FAILS TO APPLY IN EMERGENCY—If the brake fails to respond to an emergency application it is due to either Port F being too large, or Packing Ring, Q. T. 45, in Vent Piston, leaking.

BRAKE APPLIES IN EMERGENCY—If the brake applies in emergency with a service application, it is due to either Port F being stopped up, or Vent Piston, Q. T. 129, stuck in shell of Piston, Q. T. 128, or a sticky Triple Valve Piston, Q. T. 128.

LEAKS FROM TRIPLE VALVE EXHAUST PORT—If a Triple Valve leaks at the Exhaust Port, it is due to one of the following defects: Slide Valve, Q. T. 38, not seating properly, or the seat being cut; Graduating Valve, Q. T. 48, not seating properly, or the seat being cut; Quick Action Valve, Q. T. 138, or the Gasket between Triple Valve Body and the Auxiliary Reservoir leaking; or a leaky Auxiliary Reservoir Pipe.

LEAKS FROM THE ROUND VENT HOLES—If the air blows from the Round Vent Holes in the side of the Triple Valve, it is due to the Vent Valve, Q. T. 71, not seating properly.

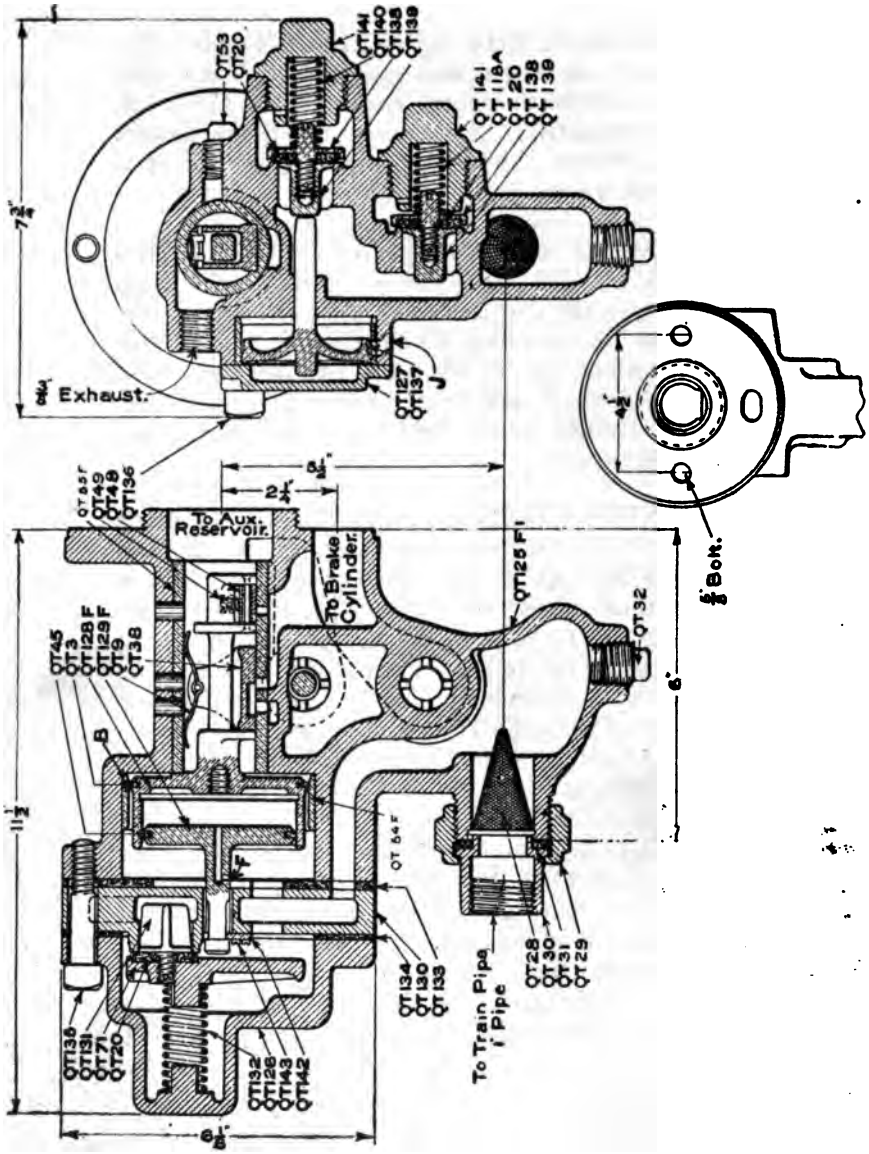
LEAKS FROM THE SQUARE VENT HOLES, PORTS J—If air blows from the Square Vent Holes, Ports J, it is due to the Quick Action Valve, Q. T. 138, not seating properly. If air blows from the Square Vent Holes, Ports J, when the brake is applied, it is due to Check Valve, Q. T. 138, leaking.

REMOVING, CLEANING AND REPAIRING TRIPLE VALVES—In removing Triple Valve from car, first close the Cut-out Cock, then disconnect the branch pipe by removing Union Nut, Q. T. 29, also remove Strainer, Q. T. 28, then remove nuts from Auxiliary studs and take down Triple Valve. Be careful not to damage gasket between Triple Valve and Auxiliary Reservior.

CLEANING TRIPLE VALVE—In cleaning Triple Valve, first remove Front Cap, Q. T. 126, and Vent Valve Seat, Q. T. 130. Care should be taken in removing these parts; the Cap, Q. T. 126, and Vent Valve Seat, Q. T. 130, should be removed perfectly straight in order not to bend Vent Valve Piston, Q. T. 129, or the Shell Cylinder in which it operates. Then remove Main Piston, Q. T. 128, and place both Pistons in a bath of light oil to cut the gum and dirt off; clean Exhaust Valve, Q. T. 38, Graduating Valve, Q. T. 48, also the seat in the Bushing.

In order to remove Vent Piston, Q. T. 129, from Vent Valve Seat, Q. T. 130, Piston Stop, Q. T. 142, will first have to be removed. Side Cap, Q. T. 127, should then be removed and the Quick Action Valve Piston, Q. T. 137, then Quick Action Valve Cap, Q. T. 141; also Check Valve, Q. T. 138, should be taken out and cleaned and replaced without oiling.

QUICK ACTION, FREIGHT TRIPLE VALVE, STYLE F 1 (NEW YORK)



QUICK ACTION, FREIGHT TRIPLE VALVE, STYLE F 1 (NEW YORK)

QT 3 Main Piston Ring (3½").
QT 9 Exhaust Valve Spring.
QT 20 Rubber Valve Seat (3 pieces).
QT 28 Strainer.
QT 29 1" Union Nut.
QT 30 1" Union Swivel.
QT 31 1" Union Gasket.
QT 32 ½" Plug.
QT 38 Exhaust Valve.
QT 45 Vent Valve Piston Ring (3").
QT 48 Graduating Valve.
QT 49 Graduating Valve Spring.
QT 53 ⅜" Plug.
QT 71 Vent Valve (includes QT 20 and 131).
QT 118A Check Valve Spring.
QT 125F1 Triple Valve Body.
QT 126 Front Cap.
QT 127 Side Cap.
QT 128F Main Piston (includes QT 3).
QT 129F Vent Valve Piston (includes QT 45).
QT 130 Vent Valve Seat.
QT 131 To order, specify QT 71.
QT 132 Vent Valve Spring.
QT 133 Main Cylinder Gasket.
QT 134 Front Cap Gasket.
QT 135 Front Cap Bolt (3 pieces).
QT 136 Side Cap Bolt (2 pieces.
QT 137 Quick Action Valve Piston.
QT 138 Check Valve (includes QT 20 and 139), (2 pieces).
QT 139 To order, specify QT 138.
QT 140 Quick Action Valve Spring.
QT 141 Check Valve Cap (2 pieces).
QT 142 Piston Stop.
QT 143 Piston Stop Screw.
QT 54F *Bushing.
QT 54F *Bushing.

*Not regularly furnished as spares and numbered only for convenience.

In cleaning Port "F" in Vent Piston always use a hard piece of wood as a piece of iron would enlarge the port and has a tendency to spoil the Quick Action feature of the Valve.

In cleaning the Main Piston, Q. T. 128, or Vent Valve Piston, do not remove the Ring unless it is worn or does not have a good bearing, as it cannot be removed without being broken or sprung out of true.

Before replacing Main Piston, Q. T. 128, see that Feed Grove "B" is thoroughly cleaned. Vent Piston, Q. T. 129, Main Piston, Q. T. 128, Cylinder Exhaust Valve, Q. T. 38, and Graduating Valve, Q. T. 48, should be oiled lightly before replacing. Do not use too much oil as it collects dirt and gums up quickly.

In replacing the Main Piston and Slide Valves care should be taken to see that Exhaust Valve, Q. T. 38, has not been turned around. When in its proper position the cavity in the Valve should be towards the Piston end.

In replacing Vent Piston, Q. T. 129, place it in Vent Valve Seat, Q. T. 130, and in position on Triple Valve body, then push the Vent Piston into its cylinder.

Before replacing Triple Valve on Auxiliary Reservoir, place the gasket over the shoulder on the Triple Valve Face and not on the Auxiliary Reservoir, to avoid damaging the gasket.

Clean out Strainer, Q. T. 28, and replace in Triple Valve, also see that Gasket, Q. T. 31, is in good condition before tightening Union Nut, Q. T. 29.

DEFECTS AND THEIR REMEDIES—If Strainer, D. C. 35, in Brake Pipe Strainer is stopped up, re-

move Spider, D. C. 36, and clean. If the Main Piston Packing Ring, Q. T. 3, or Vent Valve Piston Packing Ring, Q. T. 45, is broken or worn, it should be replaced with a new one. See that it has a good bearing all around and that both ends just meet when in the bushing.

If Exhaust Valve, Q. T. 38, or Graduating Valve, Q. T. 48, leaks, they should be refaced, also the seat refaced, and ground to a good joint.

If Vent Valve, Q. T. 71, leaks, it may have dirt on its seat, or the Vent Piston Packing Ring may fit too tight; the Vent Piston Stem, Q. T. 129, may be bent, or the Stop Plate, Q. T. 142, not being replaced properly and binding on the Vent Piston Stem.

If Quick Action Valve, Q. T. 138, leaks, it should be removed and a new rubber seat, Q. T. 20, put on if necessary.

If the Spring, Q. T. 140, is weak, stretch it or replace it with a new one so it will hold the Valve firm on the seat.

If the Check Valve, Q. T. 138, leaks, it should be ground until it has a good bearing.

If Check Valve Spring is weak, stretch it or replace it with a new one so it will hold the Valve firm on seat.

In renewing Gaskets, Q. T. 133 or Q. T. 134, be sure that they are standard thickness.

NEW YORK AIR BRAKE PARTS.

Combined 6 x 8 in. Freight Cylinder and Reservoir

BC 54 Piston Rod only.
BC 99 Reservoir (includes BC 915, BC 817A and QT32).
BC 73 Release Spring.
BC 812A Cylinder Head Bolt (pressure end) (6 pieces).
BC 812B Cylinder Head Bolt, non-pressure end (4 pieces).
BC 813A Follower Stud (3 pieces).
BC 871 6" Cylinder Gasket.
BC 915 Reservoir Tube.
BC 1063 6x8" Cylinder Body 8¼" long).
BC 2064 Non-Pressure Head.
BC 3064 Piston (includes BC54 and BC 813A).
BC 4061 Follower.
BC 4062 Packing Leather.
BC 4063 Expander.
QT 32 ½" Plug.
QT 149 Triple Valve Gasket.

1¼ inch Train Pipe Strainer

DC 7 1¼" Union Swivel.
DC 8 1¼" Union Nut.
DC 9 1¼" Union Gasket.
DC 35 Strainer.
DC 36 Spider.
DC 37 Body.
DC 78 1¼"x¾" Bushing.
DC 80 1¼"x½" Bushing.
QT 32 ½" Plug.

Pressure Retaining Valve

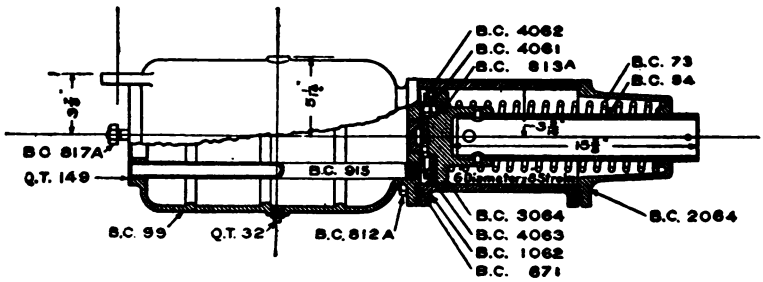
RV 36 Handle Cotter (1¼" 1¼")
PR 1A Body (bushed).
PR 1B Body (includes PR 2A-3-9 and SC 22).
PR 2A Plug.
PR 3 Handle.
PR 4 Weight.
PR 6 Case.
PR 9 Cap.
SC 22 Spring.

1¼ inch Cut-Out Cock

SC 4 Spring.
SC 11 Cap.
SC 12 Handle.
SC 99 Body (bushed).
SC 100 Plug.

1¼ inch Angle Cock.

SC 4 Spring.
SC 11 Cap.
SC 25 Handle.
SC 98 Body (bushed).
SC 100 Plug.



Combined 6" x 8" Freight Cylinder and Reservoir.

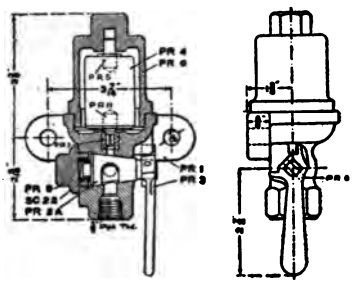


Fig. 1.

Pressure Retaining Valve.

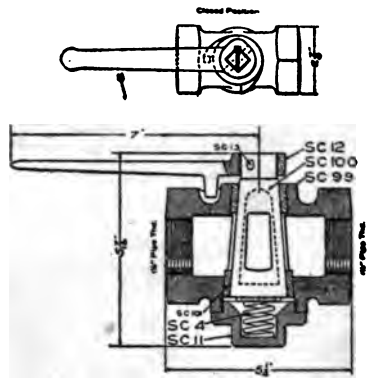


Fig. 3A.

1¼-inch Cut-Out Cock.

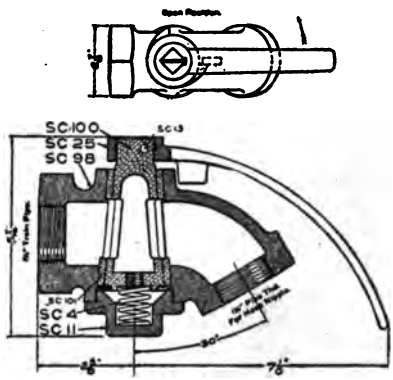
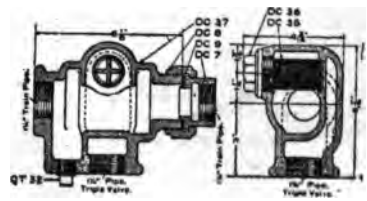


Fig. 1A.

1¼-inch Angle Cock.



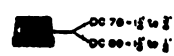
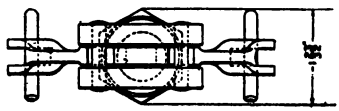


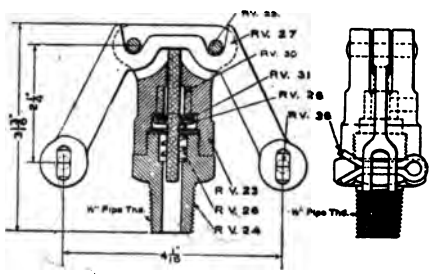
Fig. 4.

1¼-inch Train Pipe Strainer.

BRAKE CYLINDER, ETC.—The same rule that applies to the cleaning and repairing of the Westinghouse Brake Cylinders, Auxiliary Reservoirs and Release Valves, Retainers and Angle Cocks can be used for the New York Equipment.

RELEASE VALVE





RV 23 Cylinder.
RV 24 Stud.
RV 25 Vent Valve.
RV 26 Spring.
RV 27 Handle.
RV 31 Rubber Valve Seat.

FOUNDATION BRAKES.

The Foundation Brakes, which include all the Rods, Levers, Beams and Shoes, should be adjusted properly, in order to get the maximum braking power.

ADJUSTMENT OF LEVERS—When the brake is applied, the Levers should stand as nearly at right angles to the Rods as possible.

PISTON TRAVEL—The Piston Travel for a Freight Car Brake should be about 6 inches, when the car is standing, which will cause the piston to travel about 7 inches when the car is in motion, as the piston always travels about 1 inch or 1½ inches farther when car is in motion than when standing.

BRAKE POWER—The braking force applied to a freight car should be 70 per cent. of the light weight of the car.

To find the braking power of a car, multiply the distance from the middle hole of the Cylinder Lever to the Piston attachment, by the power of the Brake Cylinder Piston, and divide the product by the distance from the middle hole to the Pull Rod, which will give the stress on the Pull Rod; then multiply the distance from the Pull Rod to the Fulcrum of the Truck Lever, by the stress on the Pull Rod and divide the product by the distance from the Brake Beam to the same Fulcrum, which gives the stress on one Brake Beam, which should be multiplied by the number of Beams on the car to get the total braking power.

In figuring the brake power of a car equipped with

the New York Brake, 50 lbs. Brake Cylinder pressure is used.

In figuring the brake power of a car equipped with the Westinghouse Brake, 60 lbs. Brake Cylinder pressure is used.

Force Exerted in Brake Cylinders.

Size Cyl. Inches	With 50 lb. Pressure	With 60 lb. Pressure
6	1,400 lb.	1,700 lb.
8	2,500 lb.	3,000 lb.
10	3,900 lb.	4,700 lb.
12	5,600 lb.	6,800 lb.
14	7,700 lb.	9,200 lb.

AIR BRAKES—GENERAL ARRANGEMENT AND DETAILS.

Standards for Air Brakes on Freight Cars.

The general arrangement and details of brake gear for air-brake cars, as shown on this sheet, are standard. See letter ballot 1889, and other action 1890, 1891 and 1898. At the same time the following standards were adopted in this connection:

1. Maximum train-pipe pressure, 70 pounds per square inch.
2. Maximum brake power in freight cars, 70 per cent of the light weight of car.
3. All levers 1 inch in thickness; all pins to be 1 3-32 inches in diameter; all jaws or clevises made of ¾-inch by 2½-inch iron; all rods ¾-inch diameter.
4. Angle of brake beam lever, 40 degrees with vertical.

Drawing revised in 1896 and 1898.

The revision made in 1896 consisted in the omission of such detail dimensions as could not be used in all cases, such as the length and proportions of main levers, and the omission of some of the smaller parts from the drawing, such as the pipe clamps,

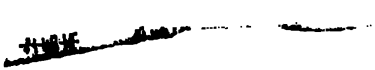
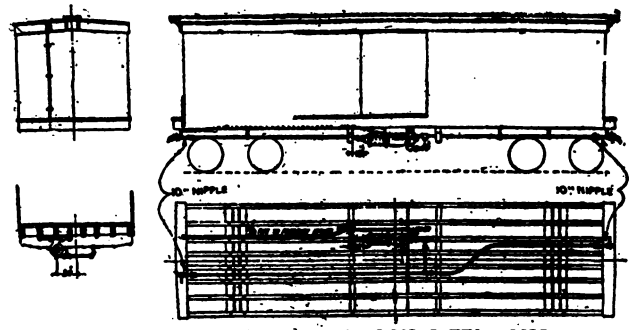
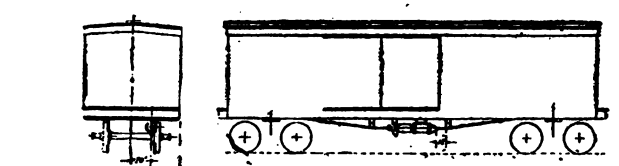


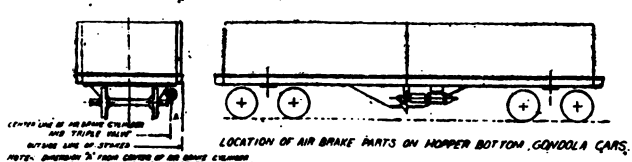
PLATE No. 97.



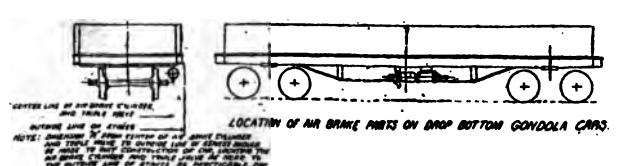
PIPING FOR BOX AND OTHER CLEAR BOTTOM CARS.



LOCATION OF AIR BRAKE PARTS ON BOX AND OTHER CLEAR BOTTOM CARS.



LOCATION OF AIR BRAKE PARTS ON HOPPER BOTTOM, GONDOLA CARS.

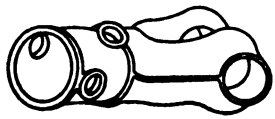


LOCATION OF AIR BRAKE PARTS ON DROP BOTTOM GONDOLA CARS.

WESTERN BRAKE JAWS.

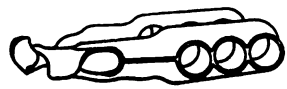
One Hole Jaw.

Two Hole Jaw.

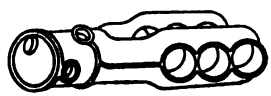


One Hole Jaw.

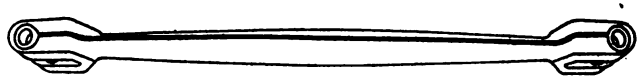
Two Hole Jaw.



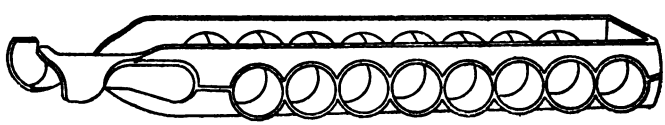
Three Hole Jaw.



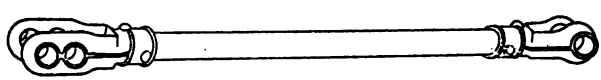
Three Hole Jaw.



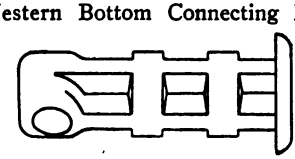
Western Mall. Iron Bottom Connecting Rod.



Western Dead Lever Guide.



Western Bottom Connecting Rod.



Malleable Iron Brake Jaw Pin.

Western Railway Equipment Company,
St. Louis, Mo.

AVERAGE COST OF MAKING REPAIRS TO VARIOUS PARTS OF CARS.

The following figures are based on the M. C. B. Rules as to prices of material and labor charges. All items not specified in the Rules are shown at the present average cost, and the average labor required to make such repairs.

These charges include all the labor necessary to remove and replace the material specified. Credit for scrap material removed has been deducted from the price of same. These estimates are based on a standard car of 80,000 pounds capacity, 36 ft. long.

PARTS	Material	Hours	Net Cost
Arch bar, top.....wrot	102 lbs.	3 hrs.	$3.01
Arch bar, bottom.....wrot	112 "	3 "	3.24
Arch bar, tie bar.....wrot	48 "	1 "	1.32
Blind ceiling (refrig. cars).....	2 ft.	¼ "	.13
Blind floor (refrig. cars).....	2 "	¼ "	.13
Blind lining (refrig. cars)	8 "	½ "	.40
Body bolster, wood.....	58 "	10 "	4.43
Body bolster, metal.....net	$24.00	10 "	26.40
Body bolster end pocket casting..cast	25 lbs.	1 "	.59
Body bolster truss block.....	3 ft.	½ "	.23

PARTS	Material	Hours	Net Cost
Body bolster truss rod.....wrot	26 lbs.	1 hrs.	$ .83
Body bolster truss rod bearing...cast	10 "	1 "	.38
Body bolster truss rod saddle strap... wrot	22 "	1 "	.73
Body bolster truss rod washer....cast	2 "	½ "	.08
Body brace.....	10 ft.	2 "	.83
Body brace rod.....wrot	13 lbs.	1 "	.53
Body center plate..... mall	50 "	3 "	2.22
Body center plate.....cast	66 "	3 "	1.64
Body center plate.....pressed steel	38 "	3 "	1.86
Body check chain eye.....wrot	3 "	½ "	.19
Body check chain hook.....wrot	2 "	½ "	.17
Body counter brace.....	10 ft.	2 "	.83
Body counter brace rod.....wrot	13 lbs.	1 "	.53
Body truss rod.....wrot	178 "	2 "	4.48
Body truss rod bearing.....cast	12 "	1 "	.41
Body truss rod block.....	3 ft.	½ "	.23
Body truss rod hopper strap.....wrot	45 lbs.	2 "	1.49
Body truss rod saddle.....cast	3 "	½ "	.16
Body truss rod washer.....cast	6 "	½ "	.20
Bogus plate (refrig. cars).....	28 ft.	3 "	1.70
Bolster spring or truck spring (single coil).....steel	23 lbs.	2 "	1.06
Bottom door rail.....	3 ft.	1 "	.35
Brake beam, wood.....	15 "	2 "	1.01
Brake beam, metal.....average	$3.00	2 "	3.48
Brake beam eye bolt or clip.....wrot	1 lb.	½ "	.08
Brake beam safety guard.....wrot	3 "	½ "	.19
Brake beam truss rod.....wrot	8 "	1 "	.42
Brake chain.....steel	6 "	½ "	.36
Brake chain sheave.....cast	5 "	½ "	.19
Brake chain worm.....cast	10 "	½ "	.26
Brake cylinder block.....	4 ft.	1 "	.38
Brake dog, pawl or finger.....cast	3 lbs.	½ "	.16

PARTS	Material	Hours	Net Cost
Brake foot board or step	6 ft.	1½ hrs.	$ .57
Brake hand rail....wrot	14 lbs.	1 "	.55
Brake hanger....wrot	8 "	½ "	.30
Brake hanger bearing or bracket.wrot	4 "	½ "	.21
Brake hanger carrier....wrot	4 "	½ "	.21
Brake hanger pin....wrot	1 "	¼ "	.08
Brake head (wood beam)....cast	22 "	1 "	.55
Brake head (metal beam) average.net	50c	4 "	1.46
Brake lever....wrot	26 lbs.	½ "	.71
Brake lever bracket brace....wrot	8 "	1 "	.42
Brake lever fulcrum (wood beam).... wrot	6 "	1 "	.38
Brake lever fulcrum (metal average)..	45c	4 "	1.41
Brake lever guide or guard....wrot	16 lbs.	1 "	.60
Brake lever stop....wrot	16 "	1 "	.60
Brake pin or key bolt....wrot	1 lb.	¼ "	.08
Brake pawl....wrot	2 "	½ "	.17
Brake ratchet wheel....mall.	5 "	½ "	.27
Brake rod (bottom)....wrot	32 "	½ "	.84
Brake rod (top)....wrot	30 "	½ "	.80
Brake shaft or mast (flat car)....wrot	28 "	1 "	.87
Brake shaft or mast (box car)....wrot	68 "	1 "	1.77
Brake safety chain....steel	4 "	½ "	.28
Brake safety chain eye bolt....wrot	1 "	¼ "	.08
Brake safety strap....wrot	2 "	¼ "	.11
Brake safety bearing....cast	12 "	½ "	.29
Brake safety bracket....mall.	3 "	¼ "	.15
Brake safety connecting rod....wrot	24 "	½ "	.66
Brake shaft step	4 ft.	1 "	.38
Brake shaft step brace....wrot	4 lbs.	½ "	.21
Brake step bracket....wrot	5 "	½ "	.23
Brake wheel....cast	18 "	½ "	.37
Brake wheel....mall.	14 "	½ "	.54
Buffer block face plate....wrot	28 "	1 "	.87
Buffer casting....cast	30 "	1 "	.66
Buffer chain worm or shaft drum.cast	9 "	½ "	.25

PARTS	Material	Hours	Net Cost
Brass, 9-inch.....net	.....	.....	$2.04
Carline.....	15 ft.	3 hrs.	1.25
Carline knee iron.....wrot	3 lbs.	½ "	.19
Carrier iron.....wrot	21 "	1 "	.71
Center plate.....mall.	52 "	3 "	2.28
Center plate.....cast	66 "	3 "	1.64
Center cross beam (coal cars).....	36 ft.	3 "	1.98
Center cross beam cap.....	6 "	1 "	.45
Center pin (head).....wrot	18 lbs.	½ "	.53
Center pin (key).....wrot	16 "	1½ "	.72
Center plate block.....	3 ft.	½ "	.23
Center sill.....	140 "	35 "	13.30
Center strut for hopper floor (hopper cars).....wrot	32 lbs.	5 "	1.92
Channel bar.....steel	165 "	10 "	7.35
Channel bar end casting.....cast	115 "	5 "	2.81
Corner plate (lower).....wrot	14 "	1 "	.59
Corner plate (middle).....wrot	4 "	½ "	.21
Corner plate (upper).....wrot	8 "	½ "	.30
Corner post.....	16 ft.	3 "	1.28
Corner post pocket.....cast	7 lbs.	1 "	.34
Cornice or moulding.....	6 ft.	1 "	.45
Coupler follower plate.....wrot	28 lbs.	4 "	1.59
Coupler pocket.....wrot	86 "	4 "	2.90
Coupler pocket rivet.....wrot	5 "	4 "	1.07
Coupler follower stop .....mall.	45 "	4 "	2.31
Coupler release rod.....wrot	15 "	½ "	.46
Coupler release rod casting.....cast	4 "	½ "	.18
Coupler release rod casting.....mall.	3 "	½ "	.21
Crosstie timber or needle beam.....	35 ft.	3 "	1.95
Crosstie timber queen post .....mall.	14 lbs.	1 "	.66
Dead block or dead wood.....	14 ft.	3 "	1.21
Dead block face plate.....wrot	28 lbs.	1 "	.87
Dead lever.....wrot	27 "	½ "	.73

PARTS	Material	Hours	Net Cost
Dead lever guide.....wrot	18 lbs.	1 hrs.	$ .65
Door bottom rail.....	3 ft.	1 "	.35
Door brace.....	3 "	1 "	.35
Door cap (wood).....	10 "	1 "	.59
Door cap (metal).....net	75c	1 "	.99
Door top rail.....	4 ft.	1 "	.38
Door center girth.....	3 "	1 "	.35
Door handle .....mall.	2 lbs.	½ "	.18
Door hanger (Dunham) .... mall. net	40c	1 "	.64
Door hasp..... mall.	1 lb.	½ "	.15
Door post.....	16 ft.	3 "	1.28
Door post rod.....wrot	14 lbs.	1 "	.56
Door roller or sheave.....net	10c	½ "	.22
Door shoe.....cast	6 lbs.	½ "	.20
Door shoe .....mall.	4 "	½ "	.24
Door stile.....	7 ft.	1 "	.49
Door stop (wood).....	4 "	1 "	.38
Door stop (metal) .....mall.	3 lbs.	½ "	.21
Door threshold plate.....wrot	20 "	1 "	.69
Door track (upper), metal.....net	50c	1 "	.74
Door track (lower), oak.....	5 ft.	1 "	.42
Door track bracket.....cast	2 lbs.	¼ "	.11
Draft gear, patented (tandem), one end.....net	$8.00	4 "	8.96
Draft gear tie rod.....wrot	37 lbs.	1 "	1.07
Draft spring or draw spring.....steel	35 "	4 "	1.84
Draft timber (long).....	38 ft.	7 "	3.01
Draft timber (short).....	17 "	7 "	2.28
Draft timber pocket or shoe.....cast	6 lbs.	1 "	.32
Draft timber tie bar.....wrot	6 "	1 "	.38
Drop door chain (hopper cars)...wrot	26 "	½ "	.71
Drop door hinge (hopper cars)...wrot	13 "	1 "	.53
Drip dish or pan (refrig. cars)..... galv. iron	26 "	6 "	2.48
End belt rail or girth.....	10 ft.	1 "	.59

PARTS	Material	Hours	Net Cost
End belt rail tie rod.....wrot	14 lbs.	1 hrs.	$ .56
End brace.....	10 ft.	3 "	1.07
End door (box car).....	.....	.....	1.95
End door (furniture car), half end....	.....	.....	3.00
End plank.....	16 ft.	1 "	.80
End plate.....	35 "	12 "	4.11
End post.....	11 "	3 "	1.11
End sill (outside siding).....	56 "	7 "	3.64
End sill (under siding).....	44 "	15 "	5.14
End sill and plate tie rod.....wrot	14 lbs.	1 "	.56
End gate rod (coal cars).....wrot	27 "	½ "	.73
Fascia (side).....	12 ft.	1 "	.66
Fascia (end).....	8 "	1 "	.52
Filling timber.....	6 "	1 "	.45
Finger guard.....wrot	3 lbs.	½ "	.19
Floating lever.....wrot	25 "	½ "	.68
Floating lever bracket.....wrot	5 "	½ "	.23
Flooring, per board.....	15 ft.	1 "	.77
Flooring, per car.....	780 "	12 "	30.18
Grab iron.....	.....	.....	.25
Hand rail (tank cars).....pipe	85 ft.	3 "	6.67
Hand rail post (tank cars).....	7 "	1 "	.49
Inside lining (end), per board.....	4 ft.	¼ "	.20
Inside lining (side), per board.....	8 "	⅓ "	.36
Intermediate sill.....	128 "	32 "	12.16
Journal bearing, 9-inch.....net	.....	.....	2.04
Journal bearing wedge.....mall.	6 lbs.	½ "	.30
Journal box.....cast	98 "	2 "	1.85
Journal box .....mall.	80 "	2 "	2.88
Journal box cover or lid.....net	20c	½ "	.32

PARTS	Material	Hours	Net Cost
Ladder round	.....	.....	$ .25
Ladder side rail	3 ft.	1½ hrs.	.47
Letter board (stock car)	6 "	1 "	.45
Live lever ..... wrot	27 lbs.	½ "	.73
Live lever guide ..... wrot	16 "	1 "	.60
Man hole cover (tank cars) ..... cast	38 "	½ "	.65
Man hole cover chain (tank cars) . steel	5 "	½ "	.32
Pedestal ..... mall.	38 "	2 "	1.62
Pedestal ..... cast	64 "	2 "	1.38
Pedestal brace or tie bar ..... wrot	56 "	1 "	1.50
Pedestal stay rod ..... wrot	18 "	1 "	.65
Pedestal casting or guide ..... cast	6 "	½ "	.20
Pipe hanger (train pipe) ..... wrot	3 "	½ "	.19
Platform plank (coal car)	18 "	1 "	.87
Push rod or bar ..... wrot	28 lbs.	½ "	.75
Purline	18 ft.	2 "	1.11
Queen post ..... mall.	14 lbs.	1 "	.66
Ridge pole	30 ft.	3 "	1.77
Roof, per board (single)	2½ "	3c	.12
Roof, per board (double)	5 "	4c	.22
Roof running board, per board	8 "	½ hrs.	.40
Roof running board, complete	80 "	6 "	4.24
Running board saddle	1 "	¼ "	.10
Running board end bracket or extension bracket ..... wrot	4 "	½ "	.21
Side belt rail	16 ft.	2 "	1.04
Safety chain ..... wrot	4 lbs.	¼ "	.15
Safety chain eye bolt ..... wrot	1 "	¼ "	.08
Sheathing, per board side	4 ft.	8c	.22
Sheathing, per board end	4 "	8c	.22
Side bearing (body) ..... cast	36 lbs.	2 hrs.	.98
Side bearing (body) ..... mall.	16 "	2 "	.96

PARTS	Material	Hours	Net Cost
Side bearing (truck).....cast	20 lbs.	2 hrs.	$ .76
Side bearing (truck).....mall.	11 "	2 "	.81
Side brace.....	12 ft.	3 "	1.14
Side bearing roller.....cast	11 lbs.	1 "	.39
Side post.....	12 ft.	3 "	1.14
Side plank (coal car).....	72 "	7 "	4.20
Side plank tie rod.....wrot	18 lbs.	1 "	.65
Side plate.....	80 ft.	25 "	8.80
Side sill (box).....	145 "	25 "	11.08
Side sill (coal).....	186 "	25 "	12.51
Sill step.....wrot	10 lbs.	½ "	.35
Side slat (stock car).....	11 ft.	1 "	.63
Spring plank or timber.....	18 "	10 "	3.03
Swing plank hanger.....wrot	40 lbs.	3 "	1.62
Swing timber or bolster.....	48 ft.	10 "	4.08
Swing timber casting.....cast	10 lbs.	1 "	.38
Stake (coal car).....	6 ft.	1½ "	.57
Stake pocket.....mall.	8 lbs.	1 "	.48
Stake pocket staple or U bolt....wrot	3 "	½ "	.19
Sub center sill.....	15 ft.	2 "	1.01
Sub carline.....	8 "	½ "	.40
Sub purline.....	12 "	1½ "	.78
Side door (box).....	.....	.....	3.65
Side door (furniture).....	.....	.....	5.00
Side door (ventilated).....	.....	.....	5.50
Side door (iron rods).....	.....	.....	4.40
Truck bolster (metal).....net average	$23.00	10 "	25.40
Truck bolster (wood).....	88 ft.	10 "	5.48
Truck bolster chafing plate.....cast	6 lbs.	½ "	.20
Truck bolster truss block.....	2 ft.	1 "	.31
Truck bolster truss rod.....wrot	34 lbs.	2 "	1.25
Truck bolster truss rod saddle....cast	4 "	½ "	.18
Truck center plate.....cast	66 "	3 "	1.64
Truck center plate .....mall.	50 "	3 "	2.22
Truck center plate pressed steel..steel	38 "	3 "	1.86

PARTS	Material	Hours	Net Cost
Truck check chain eye.....wrot	4 lbs.	½ hrs.	$ .21
Truck check chain hook.....wrot	2 "	½ "	.17
Truck column.....cast	70 "	2 "	1.46
Truck column.....mall.	35 "	2 "	1.53
Truck column guide.....cast	14 "	2 "	.68
Truck hanger.....wrot	32 "	2 "	1.20
Truck spring (single).....steel	23 "	2 "	1.06
Turnbuckle.....net	40c	1 "	.64
Turnbuckle tie bar.....	4 ft.	1 "	.38
Uncoupling lever.....wrot	15 lbs.	½ "	.46
Uncoupling lever bracket.....cast	4 "	½ "	.18
Uncoupling lever bracket.....mall.	3 "	½ "	.21
Winding shaft (hopper car).....wrot	122 "	2 "	3.23
Winding shaft ratchet.....cast	16 "	1 "	.46
Winding shaft ratchet dog.....cast	8 "	1 "	.35

M. C. B. COUPLERS AND PARTS

M. C. B. coupler, 5x5 inch steel, complete.....	$8.75
M. C. B. coupler, 5x5 inch steel, body.....net	5.45
M. C. B. coupler, 5x5 inch steel, body and knuckle.....net	7.00
M. C. B. knuckle.....net	1.55
M. C. B. coupler, 5x7 inch steel, complete.....	9.50
M. C. B. coupler, 5x7 inch steel, body.....net	6.60
M. C. B. coupler, 5x7 inch steel body and knuckle.....net	8.15
M. C. B. coupler knuckle lock.....net	.34
M. C. B. coupler knuckle pin.....net	.20

VALUES OF WOODEN FREIGHT CARS.

Per M. C. B. Rules of September 1st, 1909.

BODIES.

		LB. 60,000 Cap'y Metal Bolsters
BOX CARS.		
40 ft. long or over	$440	$524.00
36 ft. long or over, but under 40 ft	385	463.50
34 ft. long or over, but under 36 ft	360	436.00
32 ft. long or over, but under 34 ft	330	403.00
Under 32 ft. long	265	
Extra for Ventilated Fruit Cars, 36 or 40 ft. long	30	
" " " " 34 ft. long	25	
GONDOLA CARS.		
Drop Bottom 40 tons and over	$330	$403.00
Drop Bottom 30 tons and over, but under 40 tons	300	370.00
Drop Bottom 25 tons and over, but under 30 tons	275	
Drop Bottom 20 tons or under	200	
Hopper Bottom 50 tons	440	524.00
Hopper Bottom, 40 tons and over, but under 50 tons	360	436.00
Hopper Bottom, 30 tons and over, but under 40 tons	330	403.00
Hopper Bottom, 25 tons and over, but under 30 tons.	290	
Hopper Bottom, 20 tons or under	220	
Plain, 50 tons and over	350	425.00
Plain, 40 tons and over, but under 50 tons	300	370.00
Plain, 30 tons and over, but under 40 tons	275	342.50
Plain, 25 tons and over, but under 30 tons	250	
Plain, under 25 tons	140	
FLAT CARS.		
40 ft. long or over	$200	$260.00
32 ft. long or over, but under 40 ft	155	210.50
Under 32 ft. long	110	
STOCK CARS.		
34 ft. long or over	$330	$403.00
32 ft. long or over, but under 34 ft	300	370.00
Under 32 ft. long	265	
Extra for double deck	25	
Extra for feeding and watering attachments.	Actual cost.	

When the capacity of the car is 60,000 lbs., or over, ten per cent should be added to the above prices for bodies.

Extra for 8 in. Air Brake Equipment, no depreciation....$27.50
Extra for 10 in. Air Brake Equipment, no depreciation.... 35.00

Extra for Journals, 4 in. or over, 60,000 lb. capacity, or over, in cars having Metal Body Bolsters.....$40.00
Extra for cars equipped with metal center sills..... 40.00
Extra for cars equipped with Coke Racks.....Actual cost.
Refrigerator and other cars designed for special purposes .....Present cost.

TRUCKS—8 WHEEL.

50,000-60,000 lb. Capacity, Wood and Metal.....$215
60,000 lb. Capacity, or under, All Metal..... 315
80,000 lb. Capacity, or under, but over 60,000 lbs. (Metal) 400
100,000 lb. Capacity, or under, but over 80,000 lbs. (Metal) 425
Extra for Steel or Steel Tired Wheels, per car..... 112

Prices include brake beams complete, truck levers, truck lever guides and bottom connection rods.

Trucks 60,000 lbs. capacity, all metal except spring plank, to be classed as "All Metal."

The lengths of cars above mentioned refer to the lengths over the end sills.

In the case of wooden cars depreciation due to age shall be estimated at six per cent per annum upon the yearly depreciated value of such car bodies; allowances for depreciation shall in no case exceed sixty per cent of the value new. The depreciation on trucks other than all metal, 6 per cent; the depreciation on trucks all metal 5 per cent. The amounts, $27.50 and $35.00 for air brakes shall not be subject to any depreciation.

VALUES OF STEEL AND STEEL UNDER FRAME FREIGHT CARS.

Per M. C. B. Rules of September 1st, 1909.

BODIES—VALUE—NEW.

BOX CARS.

Wooden Body, metal under frame; 50 tons; 38 ft. 6 in. or over $825
Wooden Body, metal under frame; less than 50 tons; 36 ft. or over 740

GONDOLA CARS.

Hopper Bottom, all metal; 50 tons; 33 ft. long	$825
Drop Bottom, all metal; 50 tons; 40 ft. long	815
Plain, all metal; 50 tons; 40 ft. long	790
Flat Bottom, wooden body; metal under frame; 40 ft.	790
Hopper Bottom, wooden body; metal under frame; 32 ft. or over, but under 40 ft.	650

FLAT CARS.

Wooden floor, metal under frame; 50 tons, 40 ft. long	$770
Wooden floor, metal under frame; 40 tons, 40 ft. long	590
Wooden floor, metal under frame; 40 tons or over, but under 50 tons; 34 ft. or over, but under 40 ft.	510

STOCK CARS.

Wooden body, metal under frame; less than 50 tons; 36 ft. or over	$715

Extra for Air Brakes, 8 in., no depreciation	$27.50
" " " " 10 " " "	35.00

TRUCKS—8 WHEEL.

50,000-60,000 lb. Capacity, Wood and Metal	$215
60,000 lb. Capacity, or under. All Metal	315
80,000 lb. Capacity, or under, but over 60,000 lbs. (Metal)	400
100,000 lb. Capacity or under, but over 80,000 lbs. (Metal)	425
Extra for Steel or Steel Tired Wheels, per car	112

Trucks 60,000 lbs. capacity, all metal except spring plank to be classed as "All Metal."

Prices include brake beams complete, truck levers, truck lever guides and bottom connection rods.

The lengths of cars above mentioned refer to the lengths over end sills.

In the case of all-steel car bodies the depreciation shall be figured at 5 per cent per annum. In the case of car bodies with steel under frames the depreciation shall be figured at 5½ per cent per annum, with the exception of steel under frame flat cars having wooden floors, which shall be figured at 5 per cent per annum. The depreciation on trucks other than all-metal, shall be figured at 6 per cent per annum. The depreciation on all-metal trucks shall be figured at 5 per cent per annum.

Allowances for depreciation shall in no case exceed 60 per cent of the value, new.

WEIGHT IN POUNDS OF BOLTS, WITH ONE SQUARE NUT

Length of Bolt	½ inch Diam.	⅝ inch Diam.	¾ inch Diam.	⅞ inch Diam.	1 inch Diam.	1⅛ inch Diam.	1¼ inch Diam.
3 inch	¼ lb	½ lb	¾ lb	lb	lb	lb	lb
4 "	¼	½	1				
5 "	½	¾	1				
6 "	½	¾	1¼	1¾			
7 "	½	¾	1¼	2			
8 "	½	1	1½	2¼			
9 "	¾	1	1½	2¼			
10 "	¾	1	1¾	2½			
11 "	¾	1¼	1¾	2½			
12 "	¾	1¼	2	2¾	3¾	5¼	6¾
13 "	¾	1¼	2	3	4	5½	7
14 "	1	1½	2¼	3¼	4¼	5¾	7¼
15 "	1	1½	2¼	3¼	4½	6	7¾
16 "	1	1¾	2½	3½	4¾	6¼	8
17 "	1	1¾	2½	3¾	5	6½	8¼
18 "		1¾	2¾	3¾	5¼	6¾	8¾
19 "		2	2¾	4	5¼	7	9
20 "		2	2¾	4¼	5½	7½	9¼
21 "		2	3	4¼	5¾	7¾	9¾
22 "		2¼	3	4½	6	8	10
23 "		2¼	3¼	4¾	6¼	8¼	10¼
24 "		2¼	3¼	4¾	6½	8½	10¾
25 "		2½	3½	5	6¾	8¾	11
26 "		2½	3½	5¼	7	9	11½

NOTE.—When there is a fraction of an inch, of ½ inch or more, the weight for the next higher inch is to be taken. When the fraction is less than ½ inch, the weight for the next lower inch is to be taken. For example: A bolt 17½ inches long, the weight for 18 is to be taken; for one 17⅜ long, the weight for 17 is to be taken.

WEIGHT OF ROUND IRON

Per Lineal Foot

INCHES	POUNDS	INCHES	POUNDS
½	.6613	¾	37.20
¾	1.488	4	42.33
⅞	2.025	¼	47.78
1	2.645	½	53.57
⅛	3.348	¾	59.69
¼	4.133	5	66.13
⅜	5.001	¼	72.91
½	5.952	½	80.02
⅝	6.985	¾	87.46
¾	8.101	6	95.23
⅞	9.300	¼	103.3
2	10.58	½	111.8
⅛	11.95	¾	120.5
¼	13.39	7	129.6
⅜	14.92	¼	139.0
½	16.53	½	148.8
⅝	18.23	8	169.3
¾	20.01	½	191.1
⅞	21.87	9	214.3
3	23.81	½	238.7
¼	27.94	10	264.5
½	32.41		

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